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VAN DER PLANK (J. E.). **A method for estimating the number of random groups of adjacent diseased plants in a homogeneous field.**—*Trans. roy. Soc. S. Afr.*, xxxi, 3, pp. 269–278, 1946.

To determine whether an observed association of diseased plants in a field accords with an hypothesis of random distribution, or whether it is more than can be expected from chance association the author describes the following simple method which has proved to be highly efficient. If n consecutive plants are examined in sequence over a uniform area and of these μ are diseased, then the number of random groups of two adjacent diseased plants ('doublets'), $d = \frac{1}{n}\mu(\mu-1)$. All larger groups of diseased plants are reduced to doublets, three adjacent diseased plants being two doublets, and so on. The distribution belongs to the binomial series and to d is assigned a standard error of $\sqrt{\{d(1-p)\}}$, where $p = \frac{2}{n}$. For high values of n the distribution approaches the Poisson form, d having a standard error of $\sqrt{d}$. Taking as an example Bald's data for the amount of infection by spotted wilt in tomatoes [*R.A.M.*, xvi, p. 843], table 4, p. 24: $n = 360$ (12 rows of 30 plants, considered as if joined end to end in one sequence), $\mu = 173$. The expected number of doublets, if the disease is randomly scattered, is

$$\frac{173 \times 172}{360} = 82{\cdot}7,$$

the standard error $\sqrt{82{\cdot}7}$ or $\pm 9{\cdot}1$. Actually, the number of doublets observed in the field was 81 (24 runs of 2, 9 of 3, 5 of 4, 2 of 5, 2 of 6, and 1 of 7 adjacent diseased plants). Hence, there is no evidence of any spread of infection from neighbour to neighbour, a conclusion which Bald also reached using Cochran's method [ibid., xvi, p. 571].

The method can be applied to groups of any size, though the use of groups larger than doublets is generally unnecessary. The number of random groups of m adjacent diseased plants, $f_m = \frac{\mu(\mu-1)\ldots(\mu-m+1)}{n(n-1)\ldots(n-m+2)}$, $m = 2, 3, \ldots$ where n and μ have the same meaning as before. All larger groups are reduced to groups of m, a run of $m+a$ adjacent diseased plants being taken as $a+1$ groups of m. To f_m is assigned a standard error of $\sqrt{\{f_m(1-p)\}}$, where $p = \frac{m'}{n(n-1)\ldots(n-m+2)}$; for large values of n the standard error reduces to $\sqrt{f_m}$.

In practice, areal gradients of disease should be avoided by dividing the field into small blocks and applying the method to each separately. Provided the blocks are not so small that the distribution of doublets departs considerably from the Poisson form, a result for the whole area may be reached by summing, the same procedure also being applicable when scattered sets of observations have to be gathered together. As an example of this an analysis is made of records of tobacco

kromnek ([tomato] spotted wilt virus) [cf. ibid., xxv, p. 188], which, it is shown, does not spread infectiously from neighbour to neighbour.

STEVENS (N. E.) & NIENOW (INEZ). **Plant disease control by unusual methods.**—*Bot. Rev.*, xiii, 2, pp. 116–124, 1947.

In this paper [cf. *R.A.M.*, xviii, p. 125] a further account is given of some of the less usual methods of plant-disease control that have been suggested or have come into use in recent years. Most of the work referred to has already been noticed in this *Review*.

Antibiotics. Part I: microbiological.—*Ann. N.Y. Acad. Sci.*, xlviii, 2, pp. 31–98, 3 pl., 4 graphs, 1946.

This series of papers is the result of a conference on antibiotics held by the Section of Biology of the New York Academy of Sciences from 17th to 19th January, 1946. The contributions in part I (part II deals with the pharmacological applications of antibiotics) comprise (1) antibiotic substances—contribution of the microbiologist, by S. A. WAKSMAN; (2) the development of improved penicillin-producing moulds, by K. B. RAPER; (3) metabolism of penicillin-producing moulds, by M. J. JOHNSON; (4) production of antibiotic substances by Basidiomycetes, by W. J. ROBBINS, F. KAVANAGH, and ANNETTE HERVEY; (5) production of antibiotic substances by Actinomycetes, by S. A. WAKSMAN, A. SCHATZ, and D. M. REYNOLDS; and (6) antibiotic substances produced by bacteria, by J. W. FOSTER and H. B. WOODRUFF.

HOLTMAN (D. F.). **Antibiotic products of fungi.**—*Bot. Rev.*, xiii, 2, pp. 59–91, 1947.

In this paper the author reviews and discusses with numerous references to the literature of the subject the present state of knowledge concerning some antibiotic products of fungi. The aspects mainly dealt with comprise the prevalence and general characteristics of *Penicillium notatum*, culture media for penicillin production, methods of cultivating *P. notatum*, recovery of penicillin from culture media, and difficulties met with in its production, physical and chemical properties of penicillin, determination of its potency, its mode of action, its effects on infectious diseases, and agents that inactivate it; antibiotics derived from *Aspergillus* spp., and the antibiotic 'chaetomin' [*R.A.M.*, xxv, p. 130], produced by *Chaetomium cochliodes*, are reviewed briefly. A list of 161 references is appended.

WILKINS (W. H.). **Investigation into the production of bacteriostatic substances by fungi. Preliminary examination of the sixth 100 species, more Basidiomycetes of the wood-destroying type.**—*Brit. J. exp. Path.*, xxviii, 1, pp. 53–56, 1947.

The following 14 wood-destroying Basidiomycetes, grown in pure culture on malt and potato dextrose agar and tested by methods described in previous papers of this series [*R.A.M.*, xxiv, p. 158] against *Bacterium coli* and *Staphylococcus aureus*, were strongly positive: *Daedalea unicolor*, *Fomes officinalis*, *Irpex destruens*, *Lenzites sepiaria* strain 10 A, *L. thermophila*, *Polyporus borealis*, *P. obtusus*, *P. spumeus* var. *mongolica*, *Poria crassa*, *P. hymenocystis*, *P. vaporaria* strain 280, *Stereum rameale*, *Trametes lilacino-gilva*, and *T. serialis* strain 107 B. A further 43 were weakly positive and the remainder negative.

BALD (J. G.), NORRIS (D. O.), & HELSON (G. A. H.). **Transmission of Potato virus diseases. 5. Aphid populations, resistance, and tolerance of Potato varieties to leaf roll.**—*Bull. Coun. sci. industr. Res. Aust.* 196, 32 pp., 2 graphs, 1946. [Mimeoprinted.]

In continuation of the studies of potato virus diseases [*R.A.M.*, xxiii, p. 496], healthy plants of different varieties were grown around Up-to-Date plants infected

with leaf roll in field trials and it was noticed that one aphid, *Myzus persicae* [ibid., xxiii, p. 273], attacked both healthy and diseased Up-to-Date and showed no preference for any variety while the other, *Macrosiphum gei*, attacked healthy plants of any variety indiscriminately, and also slightly affected young plants but avoided those seriously stunted. Stages of development seemed to influence the aphid populations which were similar when there was only a slight difference in physiological age of the plants (similarity in stage of maturity reckoned by rate of leaf and shoot expansion). There were significant differences in the susceptibility of the varieties to leaf-roll infection attributed to reactions of the plant tissues. An index of resistance i_s/i, where i is obtained from the formula $P = 100\ (1-e^{-i})$, P being the percentage of infected plants of one variety and e^{-i} the proportion of plants not infected by aphids, and i_s is similarly obtained for a standard susceptible variety gives the probability of a healthy plant becoming infected. By this index it was shown that Bismarck has seven or eight times less likelihood of being infected than Up-to-Date. It was found that the yield of infected plants did not give a consistent indication of tolerance except in extreme cases. Bismarck, as regards yield, again shows itself to be the most resistant and intolerant of the Australian varieties and the authors show how in Bismarck crops leaf roll may tend to be eliminated by a combination of intolerance and resistance under conditions which would rapidly increase the disease in the susceptible Up-to-Date.

HUTTON (E. M.). **The relationship between necrosis and resistance to virus Y in the Potato. 3. Interrelation with virus C.**—*J. Coun. sci. industr. Res. Aust.*, xix, 3, pp. 273–282, 3 pl., 1946.

The aim of the third of this series of investigations [cf. *R.A.M.*, xxv, p. 229] into the reactions of potato virus Y was to compare the effect on potatoes of virus C [a strain of virus Y: ibid., xxv, p. 42] and virus Y separately and to analyse the inheritance of hypersensitivity, with a view to using this as a possible means of control. Duplicate sets of seedlings from selected crosses were inoculated through single leaves, one set with virus Y and one with virus C. The final reactions after six weeks were classified in both cases as mottle, systemic necrosis, leaf drop, leaf-drop streak, collapse or lethal necrosis, top necrosis, and localized necrosis. The percentages of plants falling into the various groups showed a close correlation for the two viruses. A similar correspondence was found in the numerical range of leaf lesions, the commonest in both cases being from 10 to 15 lesions per leaflet, and the total range from few to 120. The course taken by the two diseases is parallel, symptoms appearing on the inoculated leaves on the ninth day, systemic infection on the 13th or 14th, and abscission of the leaves originally inoculated on the 18th. Such similarities further support the suggestion that virus C is a strain of virus Y.

While it was found possible to increase hypersensitivity by selection, and in both cases to produce hypersensitive plants from two tolerant parents, the condition appears more frequently with virus C than with virus Y. Thus, it occurred in from 21·1 to 34·5 per cent. selected seedlings with respect to virus C, and in only 4 to 14·7 per cent. with respect to virus Y. Hypersensitivity is suggested to be due to a recessive condition, its less frequent occurrence with respect to virus Y being due to different localizing genes.

JENSEN (J. H.) & TATE (H. D.). **Aster yellows and its vector on Potatoes in Nebraska.**—*Phytopathology*, xxxvii, 1, pp. 69–71, 1947.

The occurrence in Nebraska both of the aster-yellows virus and its leafhopper vector, *Macrosteles divisus*, suggested the advisability of experiments in 1943 and 1944 to determine the effect of the disease on potatoes [*R.A.M.*, xxii, p. 493; xxiv, p. 406] in the State. Of 56 caged Triumph potato plants exposed to viruliferous leafhoppers during the winter, two developed typical aster-yellows symptoms and

one other was suspected of harbouring the virus after an incubation period of 35 to 40 days. Three out of seven asters exposed to leafhoppers collected in commercial potato plantings in the summer of 1944 also contracted infection, but negative results were given by similar tests on potatoes. Collections of *M. divisus* made in potato fields at two to seven-day intervals from 14th July to 4th October, 1943, supplemented by numerous observations in the same area from 1940 to 1945, inclusive, indicate that the leafhopper does not become abundant on potatoes until the plants have reached maturity in early August.

It is concluded that cropping practices and climatic conditions in western Nebraska do not favour the development of aster yellows on potatoes.

Davidson (R. S.) & Rich (A. E.). **The performance of new fungicides for controlling late blight on Potatoes.**—*Amer. Potato J.*, xxiv, 2, pp. 35–39, 1947.

Field trials made during 1945 and 1946 on Green Mountain potatoes at Kingston, Rhode Island, to compare Bordeaux mixture with organic fungicidal sprays against late blight (*Phytophthora infestans*) showed that in 1945 Bordeaux mixture (eight weekly applications at 10–10–100) gave the best control of the disease, the crops yielding an average of 228 bush. per acre (87 per cent. No. 1 potatoes), phygon (2 lb.–100) being next with 172, the unsprayed plots giving 118 bush. per acre. In 1946 Bordeaux (11 weekly applications at 8–4–100) again gave the best average yield of 404 bush. per acre (93 per cent.), then tribasic copper (4–100), zerlate (2–100), and phygon ($\frac{1}{2}$–100), giving 329, 282, and 278 bush. per acre, respectively. In 1945 Bordeaux was significantly better than any of the other 12 materials tested; in 1946 tribasic copper, zerlate, phygon, and methane G. 11 were also significantly better than the control treatments. Only Bordeaux and tribasic copper (in 1946 only) prevented any increase in late blight after the last spray application.

Taylor (C. F.) & Decker (P.). **A correlation between pathogenicity and cultural characteristics in the genus Actinomyces.**—*Phytopathology*, xxxvii, 1, pp. 49–58, 1947.

Of 143 isolates used in studies at Cornell University, Ithaca, New York, on the physiological characters of *Actinomyces* in relation to pathogenicity to potato tubers [*R.A.M.*, vi, p. 179; xvii, p. 198], 110 were obtained in the neighbourhood between 1930 and 1934 from scabbed potato tubers, 8 from beets [ibid., vii, p. 137 *et passim*], 3 from radishes [ibid., xiv, p. 340; xxiv, p. 401], 11 from different local sources, and 22 were procured from other laboratories or indirectly through type-culture collections. Most of the local strains were isolated by Taylor's method [ibid., xv, p. 604].

Goss's procedures for testing the pathogenicity of *A. scabies* isolates on potatoes [ibid., xvii, p. 199] were followed with several major adaptations. The experiments were conducted in a greenhouse with a temperature range from 20° to 30° C. on scab-free, formalin-treated, sprouted Green Mountain or Irish Cobbler seed pieces, which were inoculated, together with the surrounding loam-peat soil in the upper 3 in. of 6-in. pots, with an aqueous suspension of the pathogen from potato dextrose agar cultures incubated at 20° for 10 to 21 days.

Within the group investigated, the capacity to produce typical scab lesions was correlated perfectly with the formation of a dark brown ring of surface growth on separated milk. In inoculation tests with 61 such isolates (all of which were non-acid-fast), 763 out of 1,178 tubers (64·8 per cent.) contracted scab.

Partial acid-fastness in 15 strains was correlated perfectly with non-micro-aerophilic growth. Gelatine was liquefied by all the non-acid-fast isolates and by the two non-micro-aerophilic acid-fast, but not by the 13 micro-aerophilic acid-fast. Succinic, formic, oxalic, and citric acids were the most useful of the 30 carbon

sources tested for the separation of the isolates. Malic acid was the only source utilized by all the strains. All the isolates produced ammonia and no indole under the experimental conditions. All made good growth at 32°, 9 failed to develop at 35°, 101 grew at 35° but not at 40°, and 25° at 40° but not at 42°; two of the eight isolates tolerating a temperature of 42° were still capable of growth at 46°, which appeared to be near the upper limit. One of the local strains, No. 7, approximated closely to No. 3502, supplied by the culture collection at Baarn as Wollenweber's *A. tricolor* [ibid., i, p. 183]. Both were apparently identical with the species described earlier by Waksman as *A. violaceus-ruber*. A key is furnished to the isolates studied, based on bacteriological tests.

An atypical, superficial russeting of the tubers was associated with inoculation by certain otherwise non-pathogenic isolates, but the etiological nature of the relationship is not regarded as proved.

MAGROU (J.). **Facteurs biologiques et physicochimiques de la tubérisation chez la Pomme de terre (Solanum tuberosum L.).** [Biological and physico-chemical factors in the tuberization of the Potato (*Solanum tuberosum* L.).]—*Ann. Sci. nat., Bot.*, Sér. XI, iv, pp. 97–102, 4 pl., 1 fig., 1943. [Received April, 1947.]

The author states that when potato plants were grown from seeds in unfertilized soil side by side with bitter-sweet [*Solanum dulcamara*], some became infected by the symbiotic mycorrhizal fungus of the latter. The infected potatoes formed tubers, the resistant ones did not [cf. *R.A.M.*, xxvi, p. 164]. Observations showed that [potato] seedlings transplanted into uncultivated land in which plants [unspecified] with mycorrhiza were abundant developed endotrophic mycorrhiza. This occurred even when none of the associated plants belonged to the Solanaceae. A correlation was established between potato tuberization and the presence of mycorrhiza. Some potatoes resisted infection by destroying the fungus in the tissues of their rootlets by means of a phagocytic process.

In a sterile medium, tuberization occurred when the nutritive medium reached a certain critical osmotic tension. The fungi, by converting starch into sugar, merely cause, in a soil not containing fertilizer, this critical figure to be exceeded. In normal conditions of cultivation, where mycorrhiza are generally absent, tuberization is probably due to the high osmotic tension resulting from the application of manure.

BANDEMER (SELMA L.), SCHAIBLE (P. J.), & WHEELER (E. J.). **Discoloration of Potatoes after cooking as related to their composition.**—*Amer. Potato J.*, xxiv, 1, pp. 1–6, 1947.

When the values for moisture, ash, manganese, iron, and pH were determined for Sebago, Chippewa, Green Mountain, and Russet Rural potatoes grown in Michigan and were correlated with the degree of discoloration after steaming [cf. *R.A.M.*, xxiv, pp. 33, 358; xxv, p. 576] it appeared that the correlations between discoloration and moisture, moisture and pH, and between all three were all highly significant within lots from the same grower. Discoloration increased with increasing moisture and decreasing pH. Moisture content appears to be a dominant factor exercising an influence on some more directly involved component.

RYKER (T. C.). **New pathogenic races of Cercospora oryzae affecting Rice.**—Abs. in *Phytopathology*, xxxvii, 1, pp. 19–20, 1947.

Attempts are in progress to control rice leaf spot (*Cercospora oryzae*), the most serious disease of the crop in Louisiana, through the breeding of resistant strains. Of the mid-season and late varieties, Blue Rose has been classified as susceptible, and Rexoro, Fortuna, and Nira as resistant. Race 4 [*R.A.M.*, xxiii, p. 499],

attacking only Fortuna, was reported in 1940 but has not multiplied to any appreciable extent. In 1945, however, several diseased fields of Fortuna were observed, and by 1946 the number had increased. Tests on the six differential varieties indicated the presence on the infected plants of a new race (7), to which Blue Rose was susceptible as well as Fortuna. Since 1944, Rexoro has sustained severe damage in a widespread outbreak of race 6 [ibid., xxvi, p. 124]. The sole remaining resistant variety, Nira, showed some infection in 1945 and more in 1946 due to yet another new race, designated 8. Besides Nira, Fortuna was susceptible, while Blue Rose, Blue Rose 41, Caloro, and Rexoro were resistant in inoculation tests.

Sharp (C. C. T.), De Silva (C. A.), & Ford (C. E.). **Botanical and Mycological Department.**—*Rep. Rubb. Res. Bd Ceylon, 1945*, pp. 14–18, 1946.

In this report [cf. *R.A.M.*, xxiv, p. 203] it is stated that during 1945, in contrast to 1944, *Oidium* leaf disease of rubber [*O. heveae*: ibid., xxv, p. 183] was very light in all parts of Ceylon, the new foliage being the healthiest for many years. Hot, dry weather had favoured early wintering and quick refoliation. At Dartonfield a sharp attack affecting a few late-wintering trees and clones occurred towards the end of February after light showers. Leaf and pod disease were also very mild.

An abnormal form of bark canker of untapped budded trees in the Kalutara district first showed as vertical cracks in the bark, generally near the base. A fungus, believed to be a *Phytophthora* [cf. ibid., xxiv, p. 385], had spread through the inner cortex for a distance, in some cases, of over 1 ft. As a rule, most of the affected tissue lay under apparently healthy bark. Similar symptoms were noted on one other estate in the vicinity and on some trees at Dartonfield. All the affected trees were in damp situations.

Mungomery (R. W.). **Report of the Division of Entomology and Pathology.**—*Rep. Bur. Sug. Exp. Stas Qd, 1945–46*, pp. 31–38, 1946.

In this report [cf. *R.A.M.*, xxv, p. 277] it is stated that the Mossman mill area in the far north of Queensland is the only part of the State where gumming disease (*Bacterium* [*Xanthomonas*] *vasculorum*) [loc. cit.] is known to occur in commercial sugar-cane crops. During the period under review eleven farms were found to be affected. Every effort was made to expedite the propagation of resistant varieties. It is not expected that it will be possible to confine the disease indefinitely to the area at present affected, and, in the long run, control must depend on a large-scale change of varieties. A quarantine was proclaimed before the 1946 planting season which prohibited the planting of S.J. 4 and Clark's Seedling (H.Q. 426) and the removal of any cane from the area except for milling. The area quarantined included the cane-growing lands of Rocky Point, Bamboo Creek, Miallo, and Syndicate, and involved 74 farms.

The only parts of Queensland where downy mildew (*Sclerospora sacchari*) [loc. cit.] was present were Mossman and Bundaberg. At Mossman, nine fields on four farms in the Miallo area along Saltwater Creek showed the disease. Some 50 acres were affected, but except in two fields damaged by flood in 1945, infection was light. In the Bundaberg district, the disease was again confined almost entirely to the red volcanic soils of the Woongarra. About 19 affected stools were found on three farms at South Kalkie on a different soil, but 4,901 were rogued on the Woongarra, an increase of 3,602 over 1944–5. The efforts of the Cane Pest and Disease Control Board in the Bundaberg area have permitted the retention of P.O.J. 2878, and it would seem that in normal years an equilibrium had been reached between the roguings and the spread of the disease. Weather conditions in 1946 were, however, unusual and caused a sudden increase in the number of affected stools. Efforts at control were materially assisted by a return to drought conditions later. The downy mildew resistance trial in the Cairns area included seedlings from the

Northern and Central Experiment Stations, in addition to named canes and five [*Saccharum*] *robustum* varieties from New Guinea.

Results of stool counts showed no infection on E. 122, E. 240, E. 269, E. 283, 28 N.G. 289, and S.J. 4, and 0·1 per cent. infection on D. 104, D. 220, E. 120, E. 121, E. 134, E. 208, E. 209, E. 214, E. 225, E. 245, E. 249, E. 275, E. 276, 28 N.G. 251, Badila, Q. 813, and Toledo. The 28 N.G. 289 cane showed no infection in 33 stools, 28 N.G. 251 one infected stool in 32, 28 N.G. 218 8 in 40, 28 N.G. 253 4 in 21, while 28 N.G. 82 was very susceptible, with 20 affected stools in 38. The resistance trial in the Bundaberg district included only Bundaberg seedlings and standards; stalk counts showed no infection on M. 1900 Sdg.

In the Bundaberg district, 3,988 stools with Fiji disease [loc. cit.] were rogued from 24,657 acres inspected, 231 stools from the quarantined areas at Tantitha and Avondale and 3,757 from the rest of the district. New infections were found on 24 farms near Bundaberg, most of which were in the path of natural spread from affected properties. In the Isis area 49 affected stools were found on five farms. In the Maryborough–Bauple district, from the Dundowran–Nikenbah area 81 on six farms, and one each at Tinana, Mungar, and Granville, made a total of 84 affected stools compared with 72 in 1944–5. No Fiji disease was seen in the Bauple area. In the Moreton area the disease was present almost everywhere, 11,000 affected stools being found. In the Rocky Point mill area where about 15,000 tons of cane are harvested annually, Fiji disease was present in threatening amounts in P.O.J. 2878 and, to a rather less extent, in C.P. 29/116. Most of the cane in this locality is the resistance Co. 290.

As a minimum period of nearly two years must elapse, in a trial of varietal resistance to Fiji disease, between planting and the time when its reaction to the disease becomes known, an exploratory test was conducted in a glasshouse in Brisbane to ascertain if this period could be shortened. The house was gauzed on one side, was well ventilated, but proofed against flying insects. Commercial varieties of sugar-cane were grown in tubs in the house and inoculated at a suitable stage by the leafhopper vector *Perkinsiella saccharicida*. A satisfactory amount of disease appeared, and there appears to be no reason why a trial should not be completed in a suitable glasshouse in six months from the date of planting the setts. Further studies on transmission by *P. saccharicida* indicated that infective nymphs can transmit the disease in a 20-hour feeding period on healthy cane. They can remain infective for at least 16 days after removal from diseased cane. Infective nymphs transmitted the disease to healthy cane through the young rolled spindle, mature leaves, and the leaf sheath. The shortest period required for disease symptoms to appear after infective hoppers were caged on the plants was 29 days under good growing conditions, periods up to 236 days being required when the plants were stunted and poor.

Leaf scald (*Bact.* [*X.*] *albilineans*) [loc. cit.] occurs only in small amounts in the far northern mill areas, but potentially it is important, because the new varieties Q. 44 and Trojan are susceptible. A survey in the Herbert River area in 1945 showed approximately 1,100 acres of Trojan of 6,019 inspected to be affected. Most of the infection was found on farms where diseased Trojan had been planted, but 14 farms were newly infected. Approximately 500 tons of cane were lost because of the disease in 1945, and the estimated figure for 1946 was 2,000 tons. In a varietal resistance trial, Eros D. 1135 and 32–8560 [cf. loc. cit.] developed no leaf scald, while Trojan and Q. 44 were less affected than H.Q. 426 and Mahona. Cultures of *X. albilineans* retained their pathogenicity for at least 18 months.

Chlorotic streak [loc. cit.], severe in the Moreton Mill area, was recorded on the new canes Q. 28, Q. 42, Q. 49, Akbar, Solon, and Vesta for the first time there. C.P. 29/116 and P.O.J. 2878 were also attacked. The disease was also observed on P.O.J. 2878 in the Rocky Point mill area, the first Queensland record south of

Brisbane; it appears to be well established in New South Wales, just south of the Queensland border.

Dwarf disease [ibid., xx, p. 231] was found on 21 farms in the Mackay area. Red rot [*Physalospora tucumanensis*: ibid., xxv, p. 278] was prevalent in all varieties in the Mackay area during the winter as a result of dry weather conditions. It was also present in the drought-affected Bundaberg district, but appears to have caused most damage on Co. 290 in the Moreton mill area. Q. 28 appeared to be unaffected, and hopes are entertained that this variety will replace much of the susceptible Co. 290. Low temperatures in late autumn and winter resulted in widespread attacks of pineapple disease [*Ceratostomella paradoxa*: ibid., xxii, p. 453; xxv, p. 279] in the newly planted cane in the irrigated Burdekin district.

DUFRÉNOY (J.). **Nouvelles utilisations de la Canne à Sucre et maladie du 'chlorotic streak'.** [New uses for Sugar-cane and chlorotic streak disease.]—*Rev. Bot. appl.*, xxvi, 289–290, pp. 647–650, 1946.

Referring to the presence of pyridoxin (vitamin B_6) in sugar-cane and the method for detecting its presence, the author states that the distribution of this substance in the cane is markedly affected by chlorotic streak disease [*R.A.M.*, xxiv, p. 291]. If an apparently affected cane is split longitudinally, red stripes marking the position of the vascular bundles are usually found at the nodes. Bright, spherical bodies can be seen microscopically floating in the cell vacuoles; these spheres are distinctly delimited by a membrane and are very resistant, they can be removed from the cells without change of shape. They have been shown by the author to result from coacervation [cf. ibid., xxi, p. 536]. Physically, coacervation is intermediate between precipitation and crystallization. Pyridoxin, normally dispersed in the vacuolar solution, becomes condensed into a ball, floating in the watery vacuolar fluid. It becomes surrounded with a membrane composed of phosphatides and forms a very stable 'coacervate auto complex'. These coacervates are not diagnostic of chlorotic streak, as they are also found near red rot (*Physalospora tucumanensis*) lesions [ibid., xxiv, p. 338], and, occasionally, in older tissues of apparently healthy cane.

HANSFORD (C. G.). **The foliicolous Ascomycetes, their parasites and associated fungi.**—*Mycol. Pap., Imp. mycol. Inst.*, 15, 240 pp., 75 figs., 1946. 18*s.* net.

This annotated list of the foliicolous Ascomycetes, their parasites and associated fungi, especially as illustrated by Uganda specimens, is based on sixteen years' study of collections made by the author in Uganda, supplemented from parallel collections made by F. C. Deighton in West Africa.

The distinction between fungi which are (1) directly parasitic on leaves, (2) purely superficial and hence presumably saprophytic in habit, or (3) entirely parasitic on other fungi ('hyperparasites') is considered to be fundamental. When this basic distinction was applied to the forms studied it became evident that much revision of previous classifications would be necessary in order to avoid separating closely related forms. The diagnostic criteria used in the new classification are based on the nature of the host whether leaf or fungus, the method of development and absorption of nutriment, and the development and structure of the fructification. The author has endeavoured to reduce the confusion that has resulted from the difficulty of distinguishing between mixed colonies of hyperparasites and between hyperparasite and fungus host. The majority of the leaf Ascomycetes are classified into three orders: the Myriangiales, Sphaeriales, and Microthyriales. In addition there are a few Discomycetes which are placed in the Helotiales and Agyriales.

The Myriangiales (pp. 5–33) includes those families in which the 'dothidial' type of ascoma predominates. It represents the development of ectoparasitism, culminating in the entirely ectoparasitic Meliolaceae, and of separate unilocular

perithecia from the undifferentiated immersed stroma of the Myriangiaceae. The families Parodiellinaceae and Meliolaceae are treated in detail and working keys to the genera are provided, but the detailed study of the Meliolineae is deferred for later publication. The Dothidiaceae, Montagnellaceae, and Erysiphaceae are also included in this order.

The order Sphaeriales (pp. 33–159) is characterized by unilocular perithecia with a definite wall and apical pore and by a superficial mycelium without hyphopodia. The separate, superficial, external perithecia in the Sphaeriaceae become in other families immersed in the host either singly or aggregated into more or less completely immersed stromata. The Sphaeriaceae is provided with a key to the foliicolous genera (63 in number, including 4 new) having distinctions based primarily on colour and septation of the ascospores, and secondarily on the nature of the perithecia and of the parasitism (leaf or hyperparasite). For some of the genera species keys are provided. The members of the Hypocreaceae studied are hyperparasites of *Meliola* and *Asterina*; a species key is provided, the distinctions between them being based on spore morphology and dimensions and the presence or absence of perithecial setae. A common key is used for the genera *Calonectria* and *Nectria*. In the Chaetothyriaceae the author has grouped all forms (with a key to the genera) which show affinity with *Chaetothyrium guaraniticium*. The remaining families grouped in this order, viz., Mycosphaerellaceae, Gnomoniaceae, Valsaceae, Phyllachoraceae, Capnodiaceae, and Coryneliaceae are not treated in detail.

The order Microthyriales (pp. 159–199) is distinguished from the preceding order by the radiate character of the upper wall of the flattened ascoma (thyriothecium). Again there appears to be a gradual development towards extreme ectoparasitism. Generic keys, based primarily on the colour and septation of the spores and the morphology of the ascomata, are given for the families Stigmateaceae, Microthyriaceae, and Asterinaceae n. fam. The remaining families Trichothyriaceae, Trichopeltacae, and Hemisphaeriaceae are not treated in detail. In the Asterinaceae are gathered the extreme leaf ectoparasites having specialized hypopodia rarely penetrating deeper than the epidermis.

In part II (pp. 200–222) the hyperparasitic members of five families of the Fungi Imperfecti are described. Host and fungus indexes are appended. [New genera and species are listed in *R.A.M.*, supplement 13, 1946.]

Padwick (G. W.). & Khan (A.). **Notes on Indian fungi. II.**—*Mycol. Pap., Imp. mycol. Inst.*, 10, 17 pp., 10 figs., 1944. 3*s.* net.

This second contribution to the present series [*R.A.M.*, xxiii, p. 151] comprises 22 species of Indian smuts and rusts. Of the four new species erected mention may be made of *Ustilago morinae* n. sp. on flowers of *Morina longifolia*. As a result of investigations into spore germination the authors propose *Neovossia horrida* as a new combination for *Tilletia horrida* on rice. *Puccinia himalensis* on the basis of uredospore and teleutospore morphology and dimensions is considered to be a species distinct from *P. coronata*.

Padwick (G. W.). **Notes on Indian fungi. III.**—*Mycol. Pap., Imp. mycol. Inst.*, 12, 15 pp., 11 figs., 1945. 3*s.* net.

In this third contribution to the present series [see preceding abstract] 25 species (four new) are described, including *Synchytrium gei* n. sp. on leaves and petioles of *Geum elatum*, *Catacauma himalayanum* n. sp. on leaves of *Ficus faveolatus*, and *Fusarium brachygibbosum* n. sp. on sorghum. *Darluca filum* was encountered frequently on rusts which, in some cases, it had almost destroyed, all uredosori being infected [cf. *R.A.M.*, xxiv, p. 476]. Other interesting citations are *Septoria petroselini* on parsley, *Fusarium udum* var. *crotalariae* from wilted *Crotalaria medicaginea* var. *neglecta*, *F. solani* var. *minus*, a virulent pathogen causing severe

rotting of immature potato tubers, and *Coniothecium chomatosporum* causing the death of many apple-trees over large areas near Srinagar and at Sopore [ibid., xxiii, p. 393].

PADWICK (G. W.). **Notes on Indian fungi. IV.**—*Mycol. Pap., Imp. mycol. Inst.*, 17, 12 pp., 10 figs., 1946. 3*s.* net.

This further contribution to the present series [see preceding abstracts] comprises 27 species (three new), including *Ustilago vetiveriae* n. sp. in inflorescences of *Vetiveria zizanoides*, *U. bothriochloae-intermediae* n. sp. in inflorescences of *Bothriochloa intermedia*, and *Sorosporium digitariae* n. comb. (syn. *Sphacelotheca digitariae*) causing smut of *Panicum repens*.

MUNDKUR (B. B.) & THIRUMALACHAR (M. J.). **Revisions of and additions to Indian fungi. I.**—*Mycol. Pap., Imp. mycol. Inst.*, 16, 27 pp., 19 figs., 1946. 3*s.* 9*d.* net.

This is the first of a series of papers giving accounts of fungi that are new records for India or new species and such additional information on those recorded by Butler and Bisby [*R.A.M.*, xi, p. 545] or Mundkur [ibid., xviii, p. 57] as may become available. In this part there are 14 new species, including *Scopella fici* on *Ficus* sp. leaves, *Puccinia operta* (the teleutospore stage of *Uredo operta*) on *Coix lacryma-jobi*, *P. allii-cepulae* on onion, *Ravenelia acaciae-arabicae* on *Acacia arabica* and *R. berkeleyi* on *Cassia absus*; three new combinations, including *Melanopsichium eleusinis* (syn. *Ustilago eleusinis* [ibid., xviii, p. 628]) on *Eleusine coracana* and *Sphacelotheca bursa* (syn. *Ustilago bursa*) in ovaries of *Anthistiria ciliata* and other spp.; and 12 new records, including *P. eremuri* on *Eremurus himalaicus*, *P. megatherium* on *Gagea reticulata*, *P. abutili* on *Abutilon indicum*, *P. erebia* on *Clerodendron inerme*, *R. albizziae-amarae* on *Albizzia amara*, *Cercospora paneratii* on *Crinum*(?) *asiaticum*, and *Pestalotia menezesiana* which, together with *Phakopsora vitis*, causes considerable damage to vines by hastening defoliation.

MUNDKUR (B. B.) & AHMAD (S.). **Revisions of and additions to Indian fungi. II.**—*Mycol. Pap., Imp. mycol. Inst.*, 18, 11 pp., 8 figs., 1946. 3*s.* net.

This second contribution to the present series [see preceding abstract] comprises 40 species, of which 8 are new and 30 are new records for India, including *Peronospora spinaciae* [*P. effusa*] on spinach, *Linospora ochracea* on apple leaves, *Cercospora anonae* on leaves of *Annona squamosa*, *C. canavaliae* on leaves of *Canavalia ensiformis*, *C. citrullina* on water-melon leaves, *C. corchorica* on jute leaves, *C. jasminicola* on leaves of *Jasminum* spp., *C. mali* on apple leaves, *C. physalidis* on leaves of *Physalis minima*, *C. zizyphi* on leaves of *Ziziphus nummularia*, *Chlamydomyces palmarum* on leaves of cardamom, *Piper longum*, and *Rubus lasiocarpus*, and *Oidium lini* on flax.

DE SOUSA DA CAMARA (E.) & BRANQUINHO DE OLIVEIRA (A. L.). **Contributio fungorum minima in Lusitania collectorum. Ustilaginales. I.** [A small contribution of fungi collected in Portugal. Ustilaginales. I.]—*Lusit. agron.*, vii, 2, pp. 101–108, 1945.

This annotated list of 17 Portuguese Ustilaginales includes *Urocystis tritici* on wheat, *Ustilago levis* [*U. kolleri*] on oats, *U. perennans* on *Arrhenatherum elatius* [*A. avenaceum*: *R.A.M.*, xxiii, pp. 170, 475], *Sphacelotheca schweinfurthiana* on *Imperata cylindrica* [ibid., xvii, p. 270], and *S. sorghi* on sorghum.

SĂVULESCU (T.). **Einige neue Micromyceten.** [Some new Micromycetes.]—*Bull. Sect. sci. Acad. roum.*, xxv, pp. 22–30, 9 figs., 1943. [Received February, 1947.]

Latin diagnoses are given of four new species of Micromycetes collected by the author in Rumania, including *Cercosporella dictamni* on *Dictamnus albus*, *Macrosporium carthami* on safflower [*R.A.M.*, xix, p. 166], and *Epicoccum yuccae* on *Yucca filamentosa*.

M. carthami produces on both sides of safflower leaves roughly spherical or irregular, scattered, later confluent, pale chestnut or brown to ferruginous, white-centred lesions, the paler margins often raised, 3 to 5 mm. in diameter; the solitary or fasciculate conidiophores are simple, erect, cylindrical or flexuose, often with a nodular swelling at the base, uni- to triseptate, olivaceous, paler at the slightly thickened tip, 30 to 100 by 6 to 10, mostly 45 to 60 by 7·5 μ; the acrogenous, ellipsoid, ovoid, piriform, claviform, or elongated, brown to olivaceous conidia measure 70 to 115 by 15 to 21 (75 to 90 by 15 to 18) μ and are furnished with 7 to 16 transverse and 1 to 2 longitudinal septa.

E. yuccae forms on *Yucca filamentosa* leaves ash-coloured, elliptical, elongated spots, 1 to 3 by 0·5 cm., surrounded by a ferruginous margin; the sporodochia are epiphyllous, punctiform, gregarious, confluent, pulveraceous, intensely black; the hemispherical stroma, 26·5 to 40 by 13 to 26·5 μ, pale olivaceous within, brown to fuscous externally, consists of dense polyhedral cells; the conidia are globose, obovoid or piriform, sessile or furnished with a very short, hyaline pedicel, brown, multicellular, granular-verrucose, and measure 13·2 to 23·1 by 11·35 to 19·8 (19·8 by 16·5) μ. The fungus causes desiccation and slitting of the foliage, on which it is succeeded by *Cladosporium herbarum*. Comparative notes are given on the related species, *E. neglectum* [ibid., xvi, p. 491], *E. granulatum*, *E. nigrum*, *E. vulgare*, and *E. purpurascens* [ibid., xix, p. 601].

Verplancke (G.). **Addenda à la flore mycologique belge.** [Addenda to the Belgian mycological flora.]—*Ann. Soc. sci. Brux.*, Sér. 2, lx, 1, pp. 29–36, 1940. [Received April, 1947.]

Included in this annotated list of 59 fungi not hitherto recorded for Belgium are *Puccinia apii* on celery, *Melampsora euonymi-capraeacearum* on *Euonymus europaeus*, and *Ceratostomella pilifera* and *Cucurbitaria pithyophila* [*R.A.M.*, xvii, p. 493] on pine (*Pinus sylvestris*).

Sherbakoff (C. D.). **Plant-disease relation and classification of Fusaria.**—Abs. in *Phytopathology*, xxxvii, 1, pp. 20–21, 1947.

The identity of species of *Fusarium* [*R.A.M.*, xxvi, p. 218] is of great moment to plant pathologists. The author [ibid., iv, p. 705; xxiii, p. 410] upholds Wollenweber's system of classification with the following reservations. Parasitic species should retain their original binomials, e.g., *Fusarium lycopersici*, the 'form' being used only in the case of physiological departures from the type. Other species should be determined on the basis of their macroconidia in optimal development, supplemented by the distinctive features of their microconidia, conidiophores, chlamydospores, and so forth. No single character alone could hold throughout in any system of classification, and no overlapping of its extremes invalidates a character. Under these rules a name like *F. roseum* f. *cerealis* Snyder and Hansen [ibid., xix, p. 495] could not be devised. Notwithstanding the differences in their behaviour under divergent environmental conditions, the alleged great variability of *F.* spp. is more imaginary than real. The classification of the genus would be much facilitated by knowledge of methods for obtaining optimal sporulation, and by good photographs.

Sigurgeirsson (T.) & Stanley (W. M.). **Electron microscope studies on Tobacco-mosaic virus.**—*Phytopathology*, xxxvii, 1, pp. 26–38, 6 figs., 5 graphs, 1947.

Electron micrographs, prepared by the shadow-casting technique [*R.A.M.*, xxv, p. 437], of the freshly expressed juice of Turkish tobacco-plants infected by the tobacco-mosaic virus, showed most of the rod-shaped particles to measure 280 by 15 mμ. On standing at 4° C. many of these particles in the juice join end-to-end to form longer ones up to 1,500 mμ. At the end of one day a significant increase in

the number of double-length particles was apparent, and after 20 days they exceeded those near 280 mμ long. The joints founded by the end-to-end union of particles appeared to be equally strong mechanically with those in other positions along the rods. Some of the elongated particles seem to be broken up by thermal or mechanical stresses into rods of variable shorter lengths, of which those shorter than 280 mμ are apparently devoid of virus activity.

These results corroborate the assumption [ibid., xx, p. 428] that the basic infective unit of the tobacco-mosaic virus measures 280 by 15 mμ.

Takahashi (W. N.) & Rawlins (T. E.). **An electron microscope study of mutation in Tobacco-mosaic virus.**—*Phytopathology*, xxxvii, 2, pp. 73–76, 1 fig., 1 graph, 1947.

A comparative study with the electron microscope of the tobacco-mosaic virus [see preceding abstract] and a yellow mutant isolated from it [*R.A.M.*, xiii, p. 330] revealed no differences in shape or size. It is concluded from these results, combined with the evidence presented by Knight in connexion with the rib-grass [*Plantago lanceolata*] strain of tobacco mosaic [ibid., xxii, p. 44] and Knight and Stanley concerning cucumber virus 4 [cucumber green-mottle mosaic virus] (*J. biol. Chem.*, cxli, pp. 29–38, 1941), that mutations of rod-shaped viruses are not ordinarily accompanied by a modification of the particle of sufficient magnitude to be detected by the electron microscope. It follows, therefore, that an unidentified virus and a known rod-shaped one of the same particle size are in all probability related.

Graham (T. W.), Clayton (E. E.), Gaines (J. G.), Smith (T. E.), & Todd (F. A.). **Organic compounds for control of Tobacco blue mold.**—*Phytopathology*, xxxvii, 2, pp. 125–138, 3 figs., 1947.

Over 250 organic toxicants and other substances were tested for the control of tobacco blue mold (*Peronospora tabacina*) in greenhouse and plant beds from 1941 to 1946, inclusive, at Pee Dee Experiment Station, South Carolina. Large-scale supplementary plant-bed tests were further conducted at Coastal Plain Experiment Station, Tifton, Georgia, and two North Carolina branch stations [cf. *R.A.M.*, xxii, p. 410], Bismuth subsalicylate proved outstandingly and consistently effective, both as a spray (1½ lb. per 100 gals.) and dust, applied at a dosage of 10 to 15 per 100 lb., with pyrophyllite (pyrax ABB) as diluent, while benzyl salicylate (1 lb.), acetylsalicylic acid (¼ lb.), salicylamide (1½ lb.), salicylic acid (½ lb.), and sodium salicylate (½ lb.) gave better control than copper oxide-cottonseed oil (1 lb.: 1 gal.). Certain derivatives of benzoic acid, notably benzoyl peroxide (1 lb. per 100 gals.), were toxic to *P. tabacina*. Both as a spray (4 lb. per 100 gals.) and in dust form (10 to 15 per 100 lb.), fermate showed a high degree of efficiency. Tests with this compound in 1944, however, showed that relatively large quantities of dust (17 to 20 lb. per 100 sq. yds. bed area throughout the season) and thorough coverage are essential to the success of the treatment. In a limited number of tests dithane D-14 (2 qts. per 100 gals. plus 1 lb. zinc sulphate and ½ lb. hydrated lime) reduced the incidence of infection within tolerable limits. Combinations of zinc salicylate (2 lb.) with fermate, spergon, and thiosan, at 15, 10, and 10 lb., respectively per 100 lb. dust, were more effective than any of the components alone. Marked residual protection was conferred by spraying or dusting with bismuth subsalicylate, or by dusting with combinations of zinc salicylate with fermate or thiosan.

N.J. Stations reports on controlling Tomato blight.—*Food Packer*, xxvii, 11, p. 76, 1946.

On 5th July, 1946, three days after the detection of the first symptoms of tomato late blight [*Phytophthora infestans*: *R.A.M.*, xxvi, p. 220 and next abstract], B. H. Davis, of the New Jersey Agricultural Experiment Station, instituted a control

programme on a Monmouth County farm. An insoluble copper (50 per cent. metallic copper), applied six times at 10-day intervals at the rate of 4 lb. in 100 gals. water, 150 gals. per acre, resulted in the first three pickings from 100 treated plants yielding only 12 green and ripe fruits destroyed by the fungus, whereas over 2,600 were infected on 100 untreated controls. By the end of August the sprayed areas had produced twice as much marketable fruit as the untreated, while many healthy tomatoes remained for later picking. Late blight is also controllable by the application of a copper dust containing not less than 6 per cent. copper and used at the rate of 40 lb. per acre.

Smith (C. L.). **Controlling Tomato late blight.**—*Food Packer*, xxvii, 13, p. 70, 1946.

Tomato late blight [*Phytophthora infestans*] appeared in the autumn of 1945 and early spring of 1946 in Florida and extended slowly northwards, involving all the eastern seaboard States and spreading as far west as Indiana [*R.A.M.*, xxvi, p. 176]. Many growers are now considering the advisability of including tomatoes in the group of crops sprayed regularly as 'insurance', and with this question in mind inquiries were put by the Agricultural Insecticide and Fungicide Association to the plant pathologists in several States and a leading canner.

From Delaware J. W. Heuberger replied that the loss amounted to half the potential yield. The yields of the canning company which had 80 per cent. of its contracted acreage dusted by aeroplane from one to seven times averaged double those of the untreated fields. Some growers who dusted seven times with a neutral copper secured a yield of 17 tons per acre, while others using a dithiocarbamate or neutral copper obtained 20 tons in areas where the untreated fields produced less than 5 tons per acre. It is estimated that 10 per cent. of growers with 15 per cent. of the acreage attempted control.

In Pennsylvania, according to H. W. Thurston, late blight was effectively combated by spraying with Bordeaux mixture 6–3–100 or 8–4–100 or with fixed coppers at equivalent copper dosages.

W. T. Schroeder states that excellent results were obtained at Geneva, New York, with a five-treatment schedule alternating two coppers and three dithiocarbamates. Both in 1945 and 1946 diseased tomato plants appeared early in proximity to severely infected 'volunteer' potatoes.

Bretz (T. W.) & Swingle (R. U.). **Known distribution of phloem necrosis of the American Elm.**—*Plant Dis. Reptr*, xxx, 5, pp. 156–159, 1 map, 1946. [Mimeographed.]

The distribution of phloem necrosis of the American elm [*R.A.M.*, xxv, p. 283; xxvi, p. 47] is summarized as follows: parts of Ohio, Indiana, Illinois, Missouri, Iowa, Nebraska, Kansas, Oklahoma, Arkansas, Mississippi, Tennessee, Kentucky, and West Virginia.

Fate (L. R.), Dike (C. E.), & Liming (O. N.). **Culture techniques for large numbers of diseased and dead wood specimens.**—Abs. in *Phytopathology*, xxxvii, 1, p. 7, 1947.

Standard techniques have been modified and new ones developed for the daily handling of several hundred specimens in the Dutch Elm Disease Identification Laboratory. Specimens from diseased but living parts of elm trees infected by *Ceratostomella ulmi* or other vascular parasites are cultured on a simplified potato sucrose agar medium for three days at 50° F. and a further three at room temperature. Dead wood and bark material are cultured by a wet-plate technique, using excess water and low-temperature incubation for 21 days and room temperature for three. Low temperature inhibits the growth of most other organisms during the development of *C. ulmi*, while the subsequent rise, promoting coremial maturation,

is an important step in the procedure. Laboratory contaminations are effectively controlled by the use of antiseptic solutions, the upward direction of air currents, and low-temperature incubation.

MOREAU (C.). **Peuplement fongique de fruits de Diospyros lotus L. et de brous de Juglans regia L. et J. nigra L. tombés sur le sol.** [The fungal population of the fruits of *Diospyros lotus* L. and the shells of *Juglans regia* L. and *J. nigra* L. fallen on the ground.]—*Bull. Soc. linn. Normandie*, Sér. 9, iv, *1944–5*, pp. 58–62, 1946.

The mycoflora of fallen *Diospyros lotus* fruits at the Caen Botanical Garden isolated in pure culture included *Cladosporium herbarum*, *Gloeosporium kaki*, *Botrytis cinerea* [*R.A.M.*, xvi, p. 411], *Mucor mucedo*, *M. hiemalis*, *Penicillium expansum*, and *Fusarium lateritium* [*Gibberella lateritia*], which were followed about six weeks after harvesting by *Acremoniella atra* [ibid., xiv, p. 653] and a new Ascomycete, *Melanospora brevirostrata* n. sp., in association with *Trichothecium roseum*, *Gliocladium roseum*, *Trichoderma koningi*, *Stysanus stemonites* [ibid., xxii, pp. 12, 121], *Sporocybe byssoides*, *S.* sp., *Aspergillus* sp., *Cylindrocarpon* sp., and finally by *Didymium xanthopus*. The mycelium of *M. brevirostrata* forms a fine, whitish network interspersed with amber-yellow to brown bulbils and sometimes with reddish-brown, globular perithecia, surmounted by a short, well-defined beak and uniformly covered by setae.

The mycoflora of walnut (*Juglans regia* and *J. nigra*) husks largely corresponds with the foregoing, but additional species on the former were *F. avenaceum*, another *F.* sp., and *Acrostalagmus lateritius* (Berk.) Moreau [*A. cinnabarinus*], and on the latter *F. sambucinum*. *A. lateritius* develops in profusion below the shell, on the husk.

Previous literature on the mycoflora of walnuts and persimmon (*Diospyros kaki*) is briefly summarized; *D. lotus* does not appear to have been studied from this aspect.

LAIR (EUGENIE D.). **Smooth patch, a bark disease of Oak.**—*J. Elisha Mitchell sci. Soc.*, lxii, 2, pp. 212–220, 12 figs., 1946.

'Smooth patch' affecting the bark of white oak (*Quercus alba*) and post oak (*Q. stellata*) has long been present throughout the deciduous forest regions of the eastern United States. The condition has been observed on the former host in Illinois in association with *Aleurodiscus oakesii* [*R.A.M.*, xii, p. 601] and is very prevalent on both oaks near Durham, North Carolina, where it is associated with a species of *Corticium*.

The lesions were found to enlarge very slowly, the margin advancing radially in one case observed only 2·84 in. in six years. Vertical extension was, however, more rapid. The fungi most frequently isolated from affected bark near Durham were *Trichoderma viride* and a species of *Xylaria*. Eleven others, isolated occasionally, were believed to be of little significance.

Four species were tested for their ability to decompose oak bark blocks *in vitro*. Each was found capable of causing a reduction of weight of the bark, the average percentage decreases being 8 in six months for the *Corticium*, 23·8 in 11 months for *A. oakesii*, 7·6 in nine months for *Xylaria*, and 14·6 in 11 months by *T. viride*. Only the *Corticium*, however, completely enveloped the blocks; the other fungi seemed to be confined to the surface, the bark not being disintegrated in the manner characteristic of smooth patch or as occurred *in vitro* with the *Corticium*.

Microscopic examination of bark invaded by the *Corticium* showed areas of disintegrated cells that appeared as pockets. Some of these pockets were loosely occupied by hyphae interspersed with intact cells. It was ascertained that the *Corticium* could produce acid from pectin and from fats. Lignin was digested, but

cellulose not attacked. Growth was much less vigorous and profuse on media containing black oak (*Q. velutina*) bark than on white oak bark.

The fungus is named *C. maculare* n. sp., and described as follows. Fructifications on bark of living white oaks effuse, thin, adnate, and when mature cracked into minute areolae, 0·33 to 1 mm. in diameter, which flake away from the substratum, on which some white subiculum remains; the margin quickly thinning out, not byssoid; friable when dry; colour cream to dark buff. Entire receptacle about 0·5 to 4 by 0·3 to 1·5 cm., 20 to 170 μ thick, composed of delicate, thin-walled hyphae 1·8 to 3·6 μ in diameter with clamp-connexions and encrusted with mineral matter in the subhymenial zone; no cystidia or gloeocystidia; basidia cuboidal, about 3·6 μ thick, with four long, slender, incurved sterigmata; spores hyaline, 3·5 to 5·5 by 1·8 to 2·8 μ. The fungus is regarded as primary in the production of smooth patch, the other organisms being of secondary importance. This view is based on the following considerations: (*a*) the fungus, locally, is constantly associated with smooth patch lesions, and is never found on normal bark; (*b*) the white pockets of decay produced by the fungus *in vitro* correspond with the type of decay in nature, and are known to be associated with lignin-utilizing fungi; (*c*) the fungus decomposed pectin compounds; examination showed that hyphae were present between the walls of contiguous cells, while intact, free cells occurred in white pocket cavities; (*d*) the fungus utilizes fats *in vitro*, and therefore would be likely to disintegrate suberized tissues. The presence of *A. oakesii* on smooth patch lesions in other areas remains at present unexplained.

Verona (O.) & Florenzano (G.). **Notizie preliminari sopra un disseccamento delle piante di Pioppo.** [Preliminary notes on a wilt of Poplars.]—*Agricoltura ital.*, xlvi (1° N.S.), pp. 299–301, 3 pl., 1946.

During 1946, poplars of several varieties growing in two localities near Pisa (one with very wet, the other with very dry, soil) in plantations six to seven years old became completely withered and defoliated and, according to information received, trees similarly affected had died in two or three years.

Examination of dead and severely affected trees showed that the roots were normal, while the trunk in some cases presented a brown central discoloration which emitted a characteristic odour. Externally, the first and most striking symptom was the presence of brown, wrinkled, more or less regular spots on the shoots. These rapidly enlarged until the whole shoot withered and dried. A year later the withering, proceeding in a basipetal direction, spread to the branches, the bark of which developed characteristic lesions. The affected parts were paler than the healthy ones, and showed extensive cankered areas surrounded by a brown ring. The dead bark bore convex pustules 2 to 3 mm. in diameter, at first covered by the peridium and later, when this was ruptured, forming a greyish zone with a black central pore. The bark, by this time completely disorganized, easily became detached, disclosing the sapwood, which showed a brown discoloration; in some cases, traces of cicatrization callus had formed before the cambium dried. Meantime, the trees were partly or completely defoliated.

Examination of infected material showed the presence of a species of *Cytospora* [cf. *R.A.M.*, xxiv, p. 476], the imperfect state of one of the Valsaceae which was obtained in culture. Further studies are in progress on this fungus which is referred to provisionally as Valsaceae F. 13.

Day (W. R.). **The leaf scorch of Planes, caused by Gnomonia veneta (Sacc. and Speg.) Kleb.**—*Quart. J. For.*, xli, 1, p. 22, 1947.

Leaf scorch caused by *Gnomonia veneta* [*R.A.M.*, xix, p. 444; xx, p. 611] has occurred every year on planes [*Platanus* spp.] at Oxford for the past 25 years, with very little serious effect. Sometimes, however, many of the smaller twigs are

attacked and die, and are not replaced by a second crop. Trees attacked by this form of twig blight do not, as a rule, recover, though they may linger on with depleted crowns for a long time.

To control the condition, small trees may be sprayed with Bordeaux mixture or some similar fungicide as soon as the buds burst. When large trees are very seriously affected, it is probably best to resort to severe pruning of all the diseased part of the crown, virtually to the extent of pollarding. While extremely severe infection may occur in places from which all dead fallen leaves and twigs have been removed, their destruction is, nevertheless, a precautionary measure which may have value at times.

Oliveira (A. L. F.). **Um fungo parasita do Pinus halepensis, Miller.** [A parasitic fungus on *Pinus halepensis* Miller.]—*Agros*, xxvii, 3–6, pp. 158–164, 5 figs., 1944. [Received 1946.]

The fungus isolated from *Pinus halepensis* affected by die-back in Tapada da Ajuda, Portugal, in 1942 was characterized by subcuticular, erumpent, dark, spherical, ositolate pycnidia, 168 to 240 by 120 to 264 μ, and oblong, elliptical, mostly continuous, hyaline, later dark chestnut pycnospores, which on Dox's medium in turn produced ovoid, septate, thick-walled bodies, 87 by 20·3 μ. Three types of hyphae were observed, viz., (1) hyaline, sparsely septate, rich in protoplasm; (2) stout, with a dark chestnut pigment and granular content; and (3) encrusted or otherwise aberrant. Subcultures from an eight-month-old mycelium made good growth. Potato dextrose agar (2 per cent.) was the best of the media tested. Growth occurred over the wide temperature range of 5° to 35° C., with an optimum at 25°, the most favourable pH lying between 7 and 8. On the basis of these data the fungus was identified as *Diplodia pinea* (= *Sphaeropsis ellisii*) [*R.A.M.*, xxii, p. 412], the systematic position of which is briefly discussed in the light of Grove's studies [ibid., xvii, p. 68].

Positive results were given by inoculation experiments only on wounded plants of the species *P. pinaster*, *P. canariensis*, *P. halepensis*, *P. pinea*, and *P. laricio* [*P. nigra* var. *calabria*], graded in a descending order of susceptibility. *Thuya orientalis* also proved susceptible to *D. pinea*, which further attacked dry wood of *P. sylvestris*, *P. pinea*, and *P. pinaster*, causing discoloration and green streaks; pycnidia appeared on the surface in 18 to 20 days.

Buckland (D. C.). **Investigations of decay in Western Red Cedar in British Columbia.**—*Canad. J. Res.*, Sect. C, xxiv, 5, pp. 158–181, 5 pl., 3 graphs, 1 map, 1946.

This investigation of the cause of discolorations in the heartwood of western red cedar (*Thuja plicata*) in British Columbia was necessitated by the increasing exports of this timber. In total volume it ranks next to western hemlock [*Tsuga heterophylla*] and the average annual cut of 567 million bd. ft. for the past ten years is second only to that of Douglas fir [*Pseudotsuga taxifolia*].

The major heart-rotting fungi of living western red cedar in the coastal regions of British Columbia are, in decreasing order of importance, *Poria asiatica* [syn. *Leptoporus asiaticus* Pilát], causing brown cubical pocket and butt rot; *P. albipellucida* Baxter [cf. *R.A.M.*, xvii, p. 635], white ring rot; *Fomes pini* [ibid., xx, p. 435], white-pitted trunk rot; *Merulius* sp., brown crumbly butt rot; and *P. subacida* [ibid., xiv, p. 805], spongy white rot. In the interior east of the Coast Range they are *P. asiatica*, *P. weirii* [ibid., ii, p. 531; xx, p. 97], causing yellow ring rot, *F. pini*, *Polyporus balsameus* [ibid., ix, p. 148; xxiv, p. 298], brown cubical butt rot, *M.* sp., and *Poria subacida*. Less important parasites of the heartwood of living trees are *F. annosus* [ibid., xx, p. 388], *F. nigrolimitatus*, causing a white pocket rot and not previously reported on living trees, *F. pinicola*, *Armillaria mellea*, *Omphalia cam-*

panella, *Polyporus schweinitzii* [ibid., xvi, p. 428], and *Coniophora cerebella* [*C. puteana*].

The brown cubical butt and pocket rot, also called 'black rot', caused by *Poria asiatica*, is responsible for the greatest loss in living western red cedar. In the early stage of infection the wood becomes straw-coloured to pale yellow-brown, soft, and dead in appearance. Later it turns brown, becomes brittle, and breaks into small cubes, often covered with white, felt-like mycelium. Late stages of decay in the stump were either a piped rot, or a solid mass of decay not always apparently a more advanced stage of the piped condition. Higher in the trunk these two types of decay developed into typical pocket rot, or an unbroken column of decay limited to the basal 4 to 15 ft. The pocket rot extended from 6 to 80 ft. or more up the bole, severely infecting the branches which showed irregular pockets either separated by discoloured wood, or coalescing to form one large pocket.

Of the major white rots, white and yellow ring rot are so similar in appearance that the former has passed almost unrecognized, all ring rot of western red cedar having been attributed to *P. weirii*. At the yellowing stage the rot caused by *P. albipellucida* can occasionally be distinguished by a bluish or dark reddish discoloration at the limits of infection which becomes more prominent as the infected wood softens. In the advanced ring stage, *P. albipellucida* ring rot usually shows conspicuous white mycelial flecks between the laminae, and minute, elongate, fine pits on the wood surface, and is rarely fibrous. *P. weirii*, however, shows small patches or a thin web of dark brown setal hyphae between the laminae; the wood exhibits long striations, which gives the advanced rot a fibrous texture, or thin, closely wedged pockets containing, at first, white material. The final stage of white ring rot is coarsely laminated or a crumbly, shapeless mass, frequently attracting ants and termites, while that of yellow ring rot is thinly laminated and is termed 'paper rot'. Identification of the organisms by cultural methods or by the rot symptoms suggests that *P. albipellucida* is actively pathogenic only in the coastal regions, and *P. weirii* in the interior. *P. asiatica* was commonly found in association with one of the major white rots in the course of these investigations.

In all localities visited, basal wounds and fire scars were the entrance points of over 90 per cent. of the infections observed. 'Stag-head' tops, branch stubs, 'dry-side', and injured roots were also infection points, the last being of importance in young stands. The general conclusion was that *P. asiatica* was the most destructive pathogen on western red cedar throughout all the districts surveyed, nearly 70 per cent. of the infected trees being attacked by this fungus in the interior and over 50 per cent. on the coast, 30 per cent. of the length and 10 per cent. of the cubic volume being lost in trees infected by it in the former area. The high degree of incidence of *P. albipellucida* on the coast and of *P. weirii* in the interior sufficiently suggests their importance, although the small loss of poles due to these fungi indicates that they are essentially butt-rotting organisms. *P. albipellucida*, while responsible for over 40 per cent. of the infections on the coast, decays less than 2 per cent. of the volume, and about 10 per cent. of the length of infected poles. Infection by *P. weirii* in the interior, although relatively less frequent than that of *P. albipellucida* on the coast, causes approximately 8 per cent. loss of the volume and 18 per cent. of the length of infected timbers. Although the incidence of *F. pini* was low, it destroyed 15 per cent. of the volume and 50 per cent. of the pole length in timber infected by it.

Estimation of the amount of decay in standing trees is very difficult and no reliable method of prediction has been found, the nature of basal wounds being practically valueless as a criterion. Examination of growth increments covering 450 years showed that at no time did decay equal or exceed growth. Vigorous trees 30 to 50 years old can, however, be severely damaged by rot organisms. All the fungi attacking living western red cedar trees are able to continue decay in the

felled timber and most can cause decay in slash. The greatest damage to felled timber is caused by *Poria weirii*, *P. albipellucida*, and *P. subacida*. *Polyporus* [*Polystictus*] *cuneatus* and *Hymenochaete tabacina* are widely responsible for decay in sapwood and slash, the former being of major importance.

No consistent cultural characteristics were found that would distinguish *P. albipellucida* from *P. cinerescens*, although descriptions of their fructifications would readily separate them. The cultures ascribed to *Merulius* sp. could be divided into two types, 'A' and 'B', on the basis of their cultural reactions and it remains uncertain whether two organisms are involved or whether it is one species varying considerably. *Polyporus balsameus* and *Poria asiatica* are easily distinguished by comparing the sporophores and by the colour of the cultures, although young cultures are indistinguishable. The chlamydospores of *P. asiatica* are hyaline and those of *Polyporus balsameus* become dark. A check list is provided representing all the Basidiomycetes found on living and dead western red cedar in British Columbia from 1943 to 1945.

The Phomopsis disease of conifers.—*Leafl. For. Comm., Lond.*, 14, 4 pp., 3 figs., 1946.

This leaflet on the disease of conifers caused by *Phomopsis pseudotsugae* [*R.A.M.*, v, p. 259, *et passim*] is a revised edition of one that appeared some years ago. It presents in succinct form the available information on the effects of the disease on different parts of the tree (shoot die-back, stem-girdling, and stem-canker), the life-history of the fungus, age of trees affected, extent of damage, and methods of prevention.

Richardson (N. A.). **Wood preservatives** (Revised edition).—*For. Prod. Res. Rec., Lond.*, 17 (Wood Pres. Ser., 3), 10 pp., 1946.

This concise account of the wood preservatives used in England is a revised edition of a publication originally issued in 1937 [*R.A.M.*, xvi, p. 788].

Finlay (R. H.). **Timber preservation. Butt treatment.**—*Rhod. agric. J.*, xliii, 6, pp. 516–524, 3 figs., 1946.

In this paper (a reprint of *Bull.* 1159, 1940) [cf. *R.A.M.*, xxii, p. 413] detailed directions are given for the preservation of poles, mainly by the immersion process, using butt treatment. The operations involved are summarized and a note is given on the cost of the work.

Clayton (C. N.) & Nusbaum (C. J.). **Experiments on the use of vegetable seed protectants.**—*Bull. S. C. agric. Exp. Sta.* 361, 24 pp., 4 figs., 1945. [Received January, 1947.]

On the basis of the tabulated results of tests at the South Carolina Agricultural Experiment Station and of those conducted in other States, the following protectant seed treatments (in oz. per 100 lb.) are recommended in order of preference: Lima beans [*Phaseolus lunatus*], spergon 3, arasan 2; beets, cuprocide 18, semesan 40, arasan 8; cantaloupe and cucumber, cuprocide 16, semesan 5, arasan 5; lettuce, cuprocide 32, spergon 16; okra [*Hibiscus esculentus*], spergon 16, new improved ceresan 4, arasan 4; paprika [chilli], arasan 8, copper sulphate solution (1 oz. in ½ gal. water and roll in lime); peas (market or garden), spergon 3, semesan 5; soybeans (edible), spergon 5; spinach, arasan 8 to 16, cuprocide 37; maize (sweet corn), arasan 3, spergon 3; watermelon, cuprocide 16, semesan 5, arasan 5.

Flentje (N. T.). **Poor emergence in Peas. A report for the benefit of growers.**—*J. Dep. Agric. S. Aust.*, l, 5, pp. 246–249, 3 figs., 1946.

Poor germination of seed crops of William Massey, Greenfeast, and Canner's Perfection garden peas in South Australia was found to be due to destruction of the

seed three or four days after sowing by soil-inhabiting fungi. Losses of 50 per cent. were recorded in light, sandy soils; in the heavier red-brown soils of the Adelaide plains losses were much less severe. Seed sown in moderately dry soil with warm, dry conditions up to two weeks after sowing germinated much better than the same seed in moist soil and with ½ in. rain two to three days after sowing. When the peas were grown on the same land in two successive years, seed-rotting was generally much more severe in the second crop. The only seed treatment among several tested that gave beneficial results was tetroc (spergon) [cf. *R.A.M.*, xxv, pp. 128, 386]. This used at 2 oz. per bush. gave almost complete control in all soils, and very good control in second crops on the same land. The plants from the treated seed also appeared more healthy and vigorous than those from the untreated.

It is recommended that sowing should be carried out in fairly dry conditions (e.g., in the Adelaide plains in late autumn before the rains break), peas should be grown only once in five years on the same land, and all seed should be dusted with spergon.

Sayre (C. B.). **Rate of seeding treated Peas.**—*Food Packer*, xxviii, 2, pp. 63–64, 66, 1947.

From a tabulated account of preliminary tests at the New York Experiment Station in 1946 to determine the most profitable rate of sowing spergon-treated peas, it appears that 3 bush. per acre is likely to give larger net returns than 4 or 5, thereby reducing the cost of production [cf. *R.A.M.*, xxiii, p. 511 *et passim*].

Schultz (H. K.) & Dean (L. L.). **Inheritance of curly top disease reaction in the Bean, Phaseolus vulgaris.**—*J. Amer. Soc. Agron.*, xxxix, 1, pp. 47–51, 1947.

The information accumulated at the Idaho Agricultural Experiment Station on the inheritance of reaction to the beet curly top virus in beans (*Phaseolus vulgaris*) is summarized. Resistance has proved to be dominant in its mode of inheritance in crosses between the resistant Common Red Mexican, Burtner, and Great Northern U. 1. 15 [*R.A.M.*, xx, p. 42] and the susceptible Red Kidney, Park Red Kidney, and Bountiful. The cumulative experimental data indicate that two factors in dominant and recessive epistasis may explain the manner of inheritance of the curly top reaction.

McWhorter (F. P.), Boyle (L.), & Dana (B. F.). **Production of yellow Bean mosaic in Beans by virus from mottled Gladiolus.**—*Science*, cv, 2720, pp. 177–178, 1947.

In 1939 Mr. Carl Robertson, of Eugene, Oregon, drew the attention of the authors to a field of Blue Lake beans (*Phaseolus vulgaris*) next to one of *Gladiolus* spp., pointing out that a gradient infection of [bean yellow] mosaic extended from the row nearest the gladioli to a distance of some 150 ft. He expressed the view that the gladioli were probably the source of the virus [cf. *R.A.M.*, xxv, p. 303]. Subsequent observations and tests proved the assumption to have been correct. Since that date, the writers have observed the same bean virus 2 [bean yellow mosaic virus: ibid., xxiii, p. 1] correlation wherever snap beans were exposed to commercial plantings of gladioli. In 1945, for example, a two-acre test planting of *P. vulgaris* in a large, well-tilled field near Salem, Oregon, had no other legumes in the vicinity, and no usual source of the virus. One end of the field was exposed to a five-acre planting of gladioli growing weed-free in very good conditions. The bean rows ended 15 ft. away. An extremely severe outbreak of bean yellow mosaic began early in the season at the end next to the gladioli, developing into a gradient infection spreading for 200 ft. All the beans within 50 ft. of the gladioli were ruined. In a second case, near Portland, two rows of snap beans ran parallel to and

20 ft. from gladioli in a commercial field. At the end of the bean rows and equally exposed to the gladioli was a planting of Lima beans (*P. lunatus*). All the snap beans and none of the Lima beans were dwarfed by necrotic and yellow strains of yellow mosaic. No seed transmission of any strain of the virus could be demonstrated.

Yellow mosaic appears to be due to a complex of bean yellow-mosaic virus strains. In tests of commercial gladiolus plants as sources of the yellow-mosaic complex, using *Vicia faba* plants as test plants [ibid., xxi, p. 61], positive transmission resulted in four of nine trials, the isolations including not only typical bean yellow mosaic but some of the necrotic types also.

Miller (G. L.) & Price (W. C.). **Physical and chemical studies on southern Bean mosaic virus. II. Crystallization by dialysis. III. Electrophoretic and nucleic acid studies.**—*Arch. Biochem., N.Y.*, xi, 2, pp. 329–335, 337–343, 4 figs., 1946.

This study describes the crystallization of a plant virus by dialysis [cf. *R.A.M.*, xxv, p. 325] first observed at room temperature during a long dialysis of southern bean mosaic virus against distilled water. A high yield of crystals was obtained (89 per cent.) and recrystallization was readily carried out, the product being of low ash content in contrast to those gained by salting-out. The crystals were unusually large, some reaching 3–4 mm. in length and tending to be glutinous and to dissolve when in contact with glass.

The identity of the crystals was established with the virus protein itself. In general, the crystallization of the virus was observed to yield various modifications of rhombic plates and prisms against distilled water, tap water, and acetate buffer at pH 5·5. The pH of the dialysis medium and the purity of the starting material were found to be important to the crystallization process.

Electrophoretic studies of the virus by the moving boundary method [cf. ibid., xxv, p. 437] revealed a single component electrochemically stable at 0° C. within a pH range of 2·92 to 11·5, and with an isoelectric point of pH 5·5. Outside this stability range at pH 1·97 and 12·45, the virus was split into multiple components with unusual mobilities.

Sneep (J.). **De Ascochyta-vlekkenziekte van de Boon (Phaseolus).** [*Ascochyta* spot disease of the Bean (Phaseolus).]—*Tijdschr. PlZiekt.*, li, 1, pp. 1–16, 1945. [English summary. Received November, 1946.]

This is a comparative study of the symptomatology of the bean (*Phaseolus vulgaris*) diseases caused by *Ascochyta phaseolorum* [*R.A.M.*, xii, p. 330] and *A. boltshauseri* [ibid., xiv, p. 613], and *Colletotrichum lindemuthianum* [see next abstract], and of the pathogenicity, morphological and physiological characters, taxonomy, and life-histories of the causal organisms. The *Ascochyta* diseases are indistinguishable macroscopically, the characteristic symptoms of both being brown, later black, striping of the hypocotyl, leaf spots forming concentric rings, less regular pod spots, and dark spots with greenish-grey edges on the seeds. During cool, wet weather the whole plant is attacked leaving, eventually, only dark brown stems and pods. The leaf and stem spots caused by *C. lindemuthianum* are depressed and sharply demarcated by a raised yellow margin; seed spots are surrounded by a light brown border.

All varieties cultivated in Holland are susceptible to the *A.* spp., white field beans in particular. Thorough field sanitation and the use of healthy seed are the most effective control measures; ten minutes' immersion of the seed in 0·25 per cent. ceresan at 20° C. was only partially successful, while the hot-water treatment gave negative results. The two fungi persisted in a viable condition in seed stored in a dry place for 2½ years.

Hubbeling (N.). **De invloed van de uitwendige omstandigheden bij het optreden van Boonenziekten.** [The influence of environmental conditions on the occurrence of Bean diseases.]—*Tijdschr. PlZiekt.*, xlviii, 6, pp. 225–234, 5 pl., 1 graph, 1942. [English summary. Received November, 1946.]

Potash deficiency symptoms were conspicuous in beans (*Phaseolus vulgaris*) in the Wageningen district of Holland during the warm, dry months of June and July, 1941, but had disappeared by the end of the wet August.

Virus diseases, especially the bean mosaic and yellow mosaic viruses, were also widespread in June and July, when the prevailing conditions favoured the chief aphid vector, *Doralis* [*Aphis*] *fabae*. 'Stipple-streak' (*Nicotiana* virus 11 [tobacco necrosis virus: *R.A.M.*, xxiv, p. 76]) was partially masked during June and July, but in August the typical red-brown ring spots developed on the leaves. All the varieties of *P. vulgaris* investigated were susceptible to the virus, but *P. multiflorus* remained immune both in the field and in laboratory tests.

The seed-borne 'grease spot' or 'halo blight' [*Pseudomonas medicaginis* var. *phaseolicola*: ibid., ix, p. 696; xvi, p. 150], barely noticeable in June and July, severely attacked Ceka brown beans in August.

The development of rust (*Uromyces appendiculatus*) coincided with the onset of humid conditions towards the close of the season, and consequently little damage was caused.

Seed-borne infection by *Colletotrichum lindemuthianum* was responsible for the death of a number of young plants; others recovered during the hot spell in June and July, only to be heavily attacked again in August. A similar course was pursued by *Ascochyta boltshauseri*, *A. phaseolorum* [see preceding abstract], *Fusarium* sp., *Sclerotinia sclerotiorum*, and *Botrytis cinerea*, all of which flourish under cool, moist conditions.

Mastenbroek (C.). **De vatbaarheid van Bonenrassen voor de vetvlekkenziekte.** [The susceptibility of Bean varieties to the grease spot disease.]—*Tijdschr. PlZiekt.*, xlix, 5, pp. 135–162, 1 diag., 1943. [German summary. Received November, 1946.]

Of 64 bean (*Phaseolus vulgaris*) varieties tested for their reactions to the 'grease spot' or 'halo blight' disease [*Pseudomonas medicaginis* var. *phaseolicola*: see preceding abstract] in the laboratory and (for the most part) in the field, 16 were highly resistant, of which only one, Blanca, was of Dutch origin. Among the others (all American) were Robust, Cornell 22, Great Northern 81, 123, 139, Japanese white, Michelite, and Michigan white.

White rot disease of Onion bulbs. Sugar Beet yellows.—*Adv. Leafl. Minist. Agric. Fish., Lond.*, 62, 4 pp., 1 fig.; 323, 4 pp., 4 figs. (2 col.), 1946.

The available information on the symptoms, etiology, modes of dissemination and infection, and control of onion white rot (*Sclerotium cepivorum* [*R.A.M.*, xxv, p. 90] and sugar beet yellows [ibid., xxvi, p. 39] in England and Wales is summarized in popular terms.

Severin (H. H. P.). **Evidence of nonspecific transmission of California Aster-yellows virus by leafhoppers.**—*Hilgardia*, xvii, 1, pp. 21–53, 3 pl. (2 col.), 1945. [Received February, 1947.]

Studies (with J. S. Lilley) demonstrated six new vectors of the California aster yellows virus [*R.A.M.*, xxv, p. 242], *Texananus lathropi*, *T. latipex*, *T. spatulatus*, *T. oregonus*, *T. pergradus*, and *Phlepsius apertinus*. The infections produced by 150 males and 150 females of *T. lathropi* kept singly on healthy celery plants amounted to 18·7 and 16 per cent., respectively, and by 100 males and 100 females of *T. latipex* to 18 and 32 per cent., respectively. The length of the period of

exposure of healthy celery to both these leafhoppers affects virus transmission, daily transfers to and from asters causing lower percentages of infection in celery than weekly transfers. Lower percentages of infection occurred with asters than with celery, and usually they were less infected by daily than by weekly transfers. Higher percentages of infection occurred in six successive asters inoculated by *T. latipex* every three weeks than in daily or (with one exception) weekly inoculations. It appears that greater numbers of leafhoppers cause higher percentages of infection.

The minimum latent period in the males and females of *T. lathropi* was 7 and 8 days, respectively, while in *T. latipex* males it was 8 days. The maximum latent period in *T. lathropi* was 33 and in *T. latipex* 37 days. The virus was retained by single adults of *T. lathropi* for 5 to 77 days and by *T. latipex* from 1 to 42 days after the first infection. Many individuals of both species caused only a single infection each.

Single males and females of *T. spatulatus* reared on infected celery infected 34 and 29 per cent., respectively, of healthy celery plants; lots of 5 males and 5 females infected, respectively, 88 and 72 per cent. at the first transmission and 40 and 50 per cent., respectively, on transference to a second set of plants. In transferences to celery and asters alternately lots of 40 males and 40 females infected, respectively, 28·7 and 17·3 per cent. of celery in daily and 80 and 23·1 per cent., respectively, in weekly transfers; only 0·6 per cent. of the asters were infected in the daily and none in the weekly transfers. Lots of 5 males and 5 females kept on asters throughout adult life infected 8 and 12 per cent. of the plants, respectively. Lots of 40 males and 40 females reared on affected asters infected 1·7 and 0·7 per cent. of healthy plants, respectively, in daily transfers. Latency in the adults was 6 to 42 days. One male retained the virus for 84 and one female for 99 days. Most adults gave only one infection.

Males and females of *T. oregonus* tested singly on healthy celery infected 5 of 14 and 11 of 22 plants, respectively, while lots of 2 to 10 adults infected 12 of 31 plants.

Kept singly on healthy celery, 100 males and females of *T. pergradus* caused no infection; one aster was infected by 1 of 50 males. Twelve lots of 10, 25 lots of 20 and 5 lots of 40 males produced 1, 5, and 1 infections, respectively, on celery.

With *P. apertinus*, 13 males and 12 females, tested singly, infected 7 of 13 and 8 of 14 celery plants, respectively, while lots of 2 to 30 adults infected 14 of 37 plants.

Severin (H. H. P.). **Longevity, or life histories, of leafhopper species on virus infected and on healthy plants.**—*Hilgardia*, xvii, 3, pp. 121–133, 1 col. pl., 1946

The life-cycles of nine different vectors of California aster yellows virus [see preceding abstract] appear to be adversely affected in several ways if carried out on celery plants which are not virus-infected. The species concerned are *Texananus denticulus*, *T. pergradus*, *T. spatulatus*, *T. lathropi*, *Cloanthanus irroratus*, *Euscelis maculipensis*, *Colladonus geminatus*, *C. montana*, and *Idiodonus kirkaldyi*. In all cases the nymphs developed normally on infected celery or asters, but the adults died on transference to healthy plants. In *T. pergradus*, for instance, the males survived on an average for 4·8, the females for 6·7, days after transference to healthy celery as compared with no deaths in 24 days on infected plants. In *T. spatulatus* the average life of infective males and females was, respectively, 51·6 and 69 days as against 17·9 and 20·3 for non-infective insects. In *T. lathropi* an average brood on infected celery was 341 hoppers, compared with 91 on healthy plants. It further appeared that the nymphal stages required longer time for development on healthy celery. In *T. spatulatus* beet curly top virus gave a similar result although the species is not a vector of this disease. In the case of *Eutettix tenellus*, no shortening of the nymphal stages on infected beets was observed.

Severin (H. H. P.). **Transmission of California Aster-yellows virus by the first reported leafhopper vector in Gyponinae.**—*Hilgardia*, xvii, 3, pp. 139–150, 2 col. pl., 1946.

Gyponana hasta has been found to transmit California aster yellows [see preceding abstracts]. Nymphs were reared on infected celery plants and the adults transferred singly to healthy plants for the remainder of their lives. Of 50 males 18 per cent. and of 50 females 12 per cent. transmitted the virus. A few more infections were caused if a number of males or females was used, the males always inducing rather more than the females. In a similar experiment with asters only four plants of 130 became diseased. The percentages of infection caused by groups of 20 infective males transferred every three weeks to healthy plants were, in three successive periods, 52·4 (celery and asters), 28·6 (asters), and 5·3 (asters), the falling-off being ascribed in the third case to death of the males. These percentages are much higher than those for fortnightly or weekly transfers. A range in the minimum latent period of 19 to 35 days was recorded. Most adults reared as nymphs on diseased plants lost the infective dose after one infection; a range of retentivity of 11 to 46 days was found in a few male leafhoppers.

Gorlenko (M. V.) & Voronkevich (I. V.). **The cycle of development of the agent of the bacteriosis of Cucumbers Bacterium lachrymans Sm. et Bryan under natural conditions.**—*C. R. Acad. Sci. U.R.S.S.*, li, 8, pp. 641–644, 1946.

The cucumber leaf and fruit disease caused by *Bacterium* [*Pseudomonas*] *lacrymans* is stated by Sigriansky to be one of the most serious troubles affecting the crop in the U.S.S.R. [*R.A.M.*, xvi, p. 696; cf. also ibid., xvii, p. 370]. According to Galenovich and Chernysheva in 'Pests and diseases of kitchen-garden crops', 1943 [Russian], the bacteriosis causes a yield reduction of up to 50 per cent. in the Moscow province. A study was carried out at the Moscow Plant Protection Station to supplement the scanty information available in Russian literature on the life-cycle of the pathogen.

Diseased seeds were found to produce infected seedlings (with necrotic cotyledons) which either died or developed into stunted plants yielding few or no fruits. The shrivelled portions of the seedlings crumble and are conveyed by wind or raindrops to the foliage, on which they produce fresh infections. The bacteria are not confined to the seed surface but penetrate deep into the tissues, where they resisted formalin treatment, but infection was reduced from 7·1 to 1·2 per cent. by five minutes' immersion in NIUIF–1 (ethyl mercury phosphate) [ibid., xx, p. 296] at 1 in 200. The seeds contract infection at the time of collection, when bacteria from the pulp of diseased fruits penetrate the soft testas of healthy seeds in the same containers. The pathogen was shown experimentally to overwinter only in well-preserved diseased leaves left on the surface of the soil, so that plots on which cucumbers have been grown can be partially freed from infection by autumn tilling; in the course of the next year or two the leaves on the surface, like those buried under the soil, will undergo decomposition and the bacteria inhabiting them will perish. After two to three years the same ground may be replanted with cucumbers.

Sakimura (K.). **Virus transmission by Cuscuta sandwichiana.**—*Phytopathology*, xxxvii, 1, pp. 66–67, 1947.

At the Pineapple Research Institute, Honolulu, Hawaii, the cucumber mosaic virus was readily transmitted from infected to healthy cucumbers by means of an endemic species of dodder, *Cuscuta sandwichiana* [cf. *R.A.M.*, xxiv, p. 306]. Twenty-one test plants connected by the dodder with infected cucumbers contracted the disease, but no symptoms developed in 19 others to which terminal

cuttings from the parasite grown on mosaic plants were attached. The Hawaiian dodder does not appear to be so efficient as other dodders in retaining the virus. Negative results were given by repeated attempts at the transmission of the tomato spotted wilt virus from diseased to healthy plants with the aid of *C. sandwichiana*.

LEVINE (M.). **Crown gall disease on Rhubarb.**—*Bull. Torrey bot. Cl.*, lxxiv, 2, pp. 115–120, 12 figs., 1947.

In a plot at the Montefiore Hospital, New York, the author planted, together with six healthy controls, a number of rhubarb roots sent by Professor E. F. Guba, with large, tumorous masses evidently attached to or emerging from the crown, while apparently sound, pinkish buds were also present. The roots originated from stock of the 'Linnaeus' or 'strawberry' variety dating back to 1892, and had been growing on the same plot for 15 to 18 years. In 1945, during removal to another farm, some 10 per cent. of the stock was found to bear the galls, which were attributed to *B*[*acterium*] *tumefaciens*, and the intending purchaser refused to take more than half the crop. The owner, however, judging by the productivity of the stock, attached no importance to the condition.

All the experimental plants, with or without galls, produced fine, sturdy leaves in abundance, with thick, succulent petioles. Early in August, when several of those from the diseased stock were dug up, only the decomposed remains of the galls were found, the crowns and roots of the current year's growth being apparently normal. These observations corroborate the conclusion reached from previous studies on artificially induced crown galls on other garden plants [*R.A.M.*, x, p. 779] to the effect that the overgrowth is not a malignant disease in the same category with induced or spontaneous neoplasia of man or animals [cf. ibid., xxiii, p. 8 *et passim*]. It seems to be a protective mechanism of limited proliferative capacity, which matures, ages, and dies, ending as a corky, woody mass of tissue disintegrating in the soil at the close of the growing season. In the case of rhubarb, the current year's galls begin to disintegrate in the late autumn, and the new active roots and crowns may contract infection as a sequel to plucking the leaves. The slow growth of the newly formed tumours does not interfere with the freshly developing leaves, and the commercial product appears to be quite unaffected.

The rhubarb crown gall is a white mass of tissue enveloped in a heavily mottled, brownish coat. The inner structure of a fully developed gall is white and of a firm, fibrous texture. Old galls collected in November bore numerous necrotic areas round the periphery. On microscopic examination the fresh tumour reveals the characteristic appearance of crown gall.

The cultural characters of the organism isolated from diseased material closely resembled those of *Bact. tumefaciens*, not hitherto known as a pathogen of rhubarb, though slime production was exceptionally profuse and the dimensions of the rods slightly exceeded those of the tumour-producing bacteria. Inoculations with the rhubarb bacterium resulted only in the formation of well-marked scars.

HILDEBRAND (A. A.) & KOCH (L. W.). **Soybean diseases in Ontario and effectiveness of seed treatment.**—*Phytopathology*, xxxvii, 2, pp. 111–124, 1947.

All the 13 parasitic diseases of soy-bean known to occur in Canada have been found within a comparatively restricted area in south-western Ontario where the cultivation of the crop is concentrated. Eight of them have not yet been reported from other parts of the Dominion, ten have been observed in the district since 1942, while eight, or possibly nine, are known to be seed-borne. The only two of these pathogens not hitherto included in the Annual Reports of the Canadian Plant Disease Survey are *Sclerotinia sclerotiorum* and (?) *Cercosporina kikuchii* [*R.A.M.*, xvi, p. 585], both limited to Ontario.

In a three-year series of randomized experiments involving five replications, the efficacy of spergon, arasan, and fermate was tested on seed lots of the A. K. Harrow variety differing widely in respect of germinability, disease potentiality, and extent of seedcoat injury. With low-grade, weather-damaged seed, such as was produced in 1942, and the cracked-coat fraction (due to combine injury) of an otherwise superior lot grown in 1944, the use of spergon at the rate of 3 oz. per bush. increased emergence and yield. In no other instance, however, were the increases in early stands of plants resulting from seed treatment correlated with statistically significant gains in yield.

In a varietal reaction test, Earlyana was the most susceptible and Harman and Harrow A (a promising unnamed selection) were the most resistant to brown spot (*Septoria glycines*) [ibid., xxiv, p. 5; xxv, p. 297], with 89·5, 39·6, and 37·5 per cent. infection, respectively, while Lincoln and Richland were intermediate (67·7 and 66·6, respectively). There was no correlation, however, between the incidence of brown spot and seed treatment or its omission.

Marchionatto (J. B.). **Observaciones sobre el comportamento patógeno y en cultivo de la Rhizoctonia solani.** [Observations on the pathogenic and cultural behaviour of *Rhizoctonia solani*.]—*Physis, B. Aires*, xix, 54, pp. 482–484, 1 pl., 1944. [English summary. Received 1946.]

Eggplant seedlings were inoculated in 1943 with nine strains of *Rhizoctonia* [*Corticium*] *solani* originating as follows: carnation 1933, potato 1935, *Cicer arietinum* 1940, eggplant and chilli 1941, and *Pinus halepensis*, *P. radiata*, *P. pinea*, and *P. insignis* 1942. Five tests of a month's duration were performed, each involving three isolates; the resulting data showed that those of 1933 and 1935 had lost all virulence, while the 1941 and 1942 strains were still highly pathogenic and the 1940 material fairly so.

The nine strains fell into three groups in respect of their cultural characters on potato dextrose agar, namely, No. 243, with a well-developed chestnut-brown mycelium rapidly forming very minute, dark chestnut sclerotia with a tendency to disposition in lines along the wall of the tube; No. 403 with a sparse, brown mycelium, larger chestnut sclerotia distributed over the surface of the medium and scattering on reaching the wall; and No. 195, with a fairly abundant, pale yellow mycelium and compact, dark masses of sclerotia produced at both extremities of the substratum.

Atkins (F. C.). **White plaster mould.**—12 pp., 2 figs., 2 diags., Mushroom Growers' Association, Midlands Group Publications, Yaxley, Peterborough [? 1946]. 2*s.* 6*d.*

In this digest are presented for the use of mushroom-growers the history, nomenclature, morphology, cultural characteristics, and control [*R.A.M.*, xix, p. 191] of the white plaster mould, *Scopulariopsis* [*Oospora*] *fimicola*.

Nichols (R. F. W.). **Breeding Cassava for virus resistance.**—*E. Afr. agric. J.*, xii, 3, pp. 184–194, 1947.

A full interim report is given on the materials and methods now in use at Amani, Tanganyika Territory, in breeding for resistance to cassava mosaic and brown streak [*R.A.M.*, xxv, p. 27]. The first stage was the production of seed of both cassava and interspecific hybrids and the vegetative multiplication of the progeny. Field trials [ibid., xvii, p. 649] for resistance and cropping qualities were conducted in an area where disease incidence was high, and the clones were classified on a basis of resistance to natural infection as shown by statistical analyses of the results. Only those plants which escaped infection from both diseases for more than eight months (class I) or six months (class II) or showed abnormally high yields

although susceptible were retained for further breeding. Those apparently immune were tested by stem-grafting.

Interspecific hybridization was achieved between cassava and 'tree' cassava (probably a natural hybrid between *Manihot glaziovii* [Ceara rubber] and cassava), *M. glaziovii*, *M. dichotoma*, and *M. saxicola*. Back-crossing to cassava was successful. The fertility, morphology, and resistance of these hybrids are described. Strongly resistant forms of cassava and of interspecific hybrids were produced, but the results suggest that complete immunity is likely to be secured only in the *M. dichotoma* hybrids. Emphasis is laid on the fact that the efficacy of the grafting test to demonstrate immunity is governed by the particular virus strain used; immunity from one strain does not necessarily mean immunity from all.

Conclusive evidence was obtained that resistance is completely independent of climatic and soil factors; it is, therefore, to be assumed that inheritance is controlled by genetic factors.

In the cassava × cassava hybrids fertility is very low, high field resistance to mosaic and brown streak occurred in a few clones but most were susceptible. None of the highly resistant clones gave very high yields. No cassava plant so far tested by grafting with affected material has withstood infection by either disease. In the tree cassava × cassava crosses, the parent tree cassava clone was in class I for resistance to both diseases, but it was experimentally infected with mosaic by *Bemisia* sp. Although the fertility of the F_1 hybrids was very low, the plants were very vigorous and fertility improved in subsequent back-crosses. The indications for resistance in the F_3 generation (second back-cross) are encouraging, 43 clones being retained for field trial.

The *M. dichotoma* × cassava crosses so far promise the best results. All the F_1 plants remained healthy for 22 months but all were sterile at first; seeds were obtained later as a result of open pollination and by colchicin treatment. In work with the *M. saxicola* × cassava cross, *M. saxicola* was found to be highly susceptible to mosaic. The hybrids, however, are highly fertile and a watch is being kept for resistant plants. From the Ceara × cassava crosses three F_2 (first back-cross) clones have been obtained which show class I resistance to both diseases.

Gohier (C.). **Note sur la maladie du rabougrissement ou rosette de l'Arachide à Madagascar.** [A note on the stunting disease or rosette of Groundnut in Madagascar.]—*Rev. Bot. appl.*, xxvi, 289–290, pp. 638–641, 1946.

During 1945–6, over 60 per cent. of the groundnut plantations in the vicinity of Itasy, Madagascar, gave no yield as a result of rosette [*R.A.M.*, xviii, p. 652; xxv, p. 154]. Under local conditions, attack by rosette becomes likely if during the first two months after planting retardation of growth for a few days occurs. When seed of the same variety from different areas is planted, the plants which grow most rapidly always appear to escape infection best. A slow-growing variety, Virginia Bunch, had to be discontinued at Itasy, as it always developed more rosette than earlier varieties, such as Buitenzorg and Valencia. Sowings from the same lot of seed made in the same soil at intervals of two or three days sometimes showed no infection in the first lot and 90 per cent. in the second. Late sowings made in December, after the rains have set in (sometimes planted because the November sowing has failed owing to insufficient rain), generally become so severely affected during the first two months that they give practically no yield.

In years when rosette is not very prevalent, isolated plants are attacked; circular patches of infection appear but do not spread, owing to the rapid growth of the remaining plants; the affected patches give no yield. Insect transmission [by *Aphis laburni*: ibid., xviii, p. 652] from diseased plants to very young healthy ones is generally admitted, and almost certainly occurs. If young plants are insect-infested in the main stem, the disease arrests growth above, but when a plant over

two months old becomes infected in this way, the disease almost invariably remains confined to a single branch, and the yield is not much affected.

In some years, however, a field apparently normal during the first month's growth slows down and suddenly becomes completely affected, though an adjacent field, planted a few days earlier, remains healthy. This type of attack would seem to be due, not to insect transmission, but to the effect of climatological factors, e.g., light intensity or special rays, occurring at a specific stage in the growth of the young plants. The Itasy region, situated at 1,100 to 1,500 m. above sea-level, has, at certain hours, particularly early in the rainy season, an extremely high light intensity. Attempts to reduce rosette incidence in young plants by protecting them from the solar rays by cloth screens gave completely satisfactory results, affected plants appearing only in the unprotected part of the field and at the edge of the covered part. The cover was removed at the end of two months' growth. In severely affected fields, groundnuts growing in the shade of some adventitious plant, such as *Ricinus*, are nearly always either unaffected or much less affected than the rest.

The author's observations lead him to the view that groundnut rosette is consecutive to the spontaneous appearance of special bodies formed within the host cells under the influence of light or other radiations while the plants are very young. The bodies would appear to be, probably, of the nature of heavy proteins, capable, after inoculation, of reproducing the disease indefinitely in plants of the same species. They possess the properties of diastases. There may be some similarity between this disease and vine court-noué [ibid., xxvi, p. 6], which also does not develop in the shade, is found in areas with a high light intensity, shows similar malformations, and is insect-transmitted.

Bosc (M.). **Sur les enclaves de l'oospore de Plasmopara viticola (Berk. et Curt.) Berl. et de Toni.** [On the contents of the oospore of *Plasmopara viticola* (Berk. & Curt.) Berl. & de Toni.]—*C. R. Acad. Sci., Paris*, ccxxiv, 9, pp. 667–668, 1947.

The inception of oospore formation in *Plasmopara viticola* [*R.A.M.*, xxvi, p. 94] in October was accompanied by the appearance of lipoid globules, staining with indophenol blue, Sudan III, and osmic acid and rapidly coalescing into a large central vacuole which gradually assumed a homogeneous structure and disintegrated into a mass of small globules shortly before the germination of the oospore in April to May. Starch granules 2 to 6 μ in diameter, staining blue with Lugol's iodine solution, were also observed at the beginning of oospore formation. They were either free or enclosed in a mass staining walnut-brown or yellow with Lugol, and are believed to be metabolic products of the above-mentioned lipoids. The existence of the starch granules in the form described is of brief duration; after chemical modification and fusion with the cytoplasm they are presumably concentrated in the endospore where Best's carmine and Bauer's reagent reveal the presence of saccharides.

Simon (L.). **Essais sur l'Oidium en 1943 au vignoble expérimental de Belle-Beille.** [Tests on *Oidium* in 1943 in the experimental vineyard of Belle-Beille.]—*Ann. Épiphyt.*, N.S., xi, 1–2, pp. 115–120, 1945. [Received March, 1947.]

In further work on the control of vine *Oidium* [*Uncinula necator*: *R.A.M.*, xxv, p. 434] at Belle-Beille, all the plots, including the control, received an application of alkaline Bordeaux mixture containing 0·75 kg. copper sulphate+125 gm. potassium permanganate per hl. on 1st June, with one of the latter alone on 24th June and the morning of the 17th July. In addition, plot A received 500 gm. triturated sulphur (80 per cent.) per hl.+wetter on 26th June, followed by 1 kg. of the same+wetter on 17th (evening) and 30th July. Plot B was dusted with sulphur ore

containing 10·7 per cent. pure sulphur on the same last three occasions. Plot C received triturated sulphur (80 per cent. pure sulphur) on 26th June and on the evening of 17th July. Plot D (control) received no sulphur. Plots E and F received, respectively, commercial colloidal sulphurs B and C, the former containing 500 gm. and the latter 200 gm. elemental sulphur per l. on 26th June, 17th July (evening), and 30th July. The plots thus received 29·2, 14·4, 72, 0, 8·2, and 3·28 kg. pure sulphur, respectively.

On 25th August, and on 30th September (immediately before harvesting) the control ratings (0 = no control, 10 = complete) were, plot A = 3, B = 6, C = 9, D = 0·5, E = 2, and F = 4. The crop of plot C was of much better quality than that of B. Thus, the use of a sulphur ore containing 10·7 per cent. sulphur gave results approximating to those given by 80 per cent. triturated sulphur on vines already treated with potassium permanganate. This result confirms those of 1942 [loc. cit.]. It was also ascertained that a slight attack of *U. necator* on the fruit reduced the crop by 14·4 per cent., but did not appreciably affect the sugar content of the berries. It appears that in future it will be possible in the control of the disease to make greater use of home-produced sulphur than has been the case in the past.

Staehelin (M.) & Wurgler. **Quelques cas de rabougrissement de la Vigne.** [Some cases of Vine die-back.]—*Rev. romande Agric., Vitic., Arboric., 1947*, 2, pp. 11–14, 5 figs., 1947.

The form of vine die-back investigated by the authors in Switzerland is characterized by short, thin tendrils, slight chlorosis and reddish-brown spotting of the foliage, and a tendency to 'coulure' [*R.A.M.*, xxvi, p. 182]. It is due to a number of causes, of which only two are discussed in the present contribution, namely, the use of immature stocks for grafting, resulting in imperfect unions, and injuries of various kinds inflicted in grafting and other cultural operations. Defective unions give rise to the cortical fissures, permitting the entry of fungi causing medullary rots, and to the formation of false callus at the juncture between scion and stock, which is attended by occlusion of the vessels with tyloses and consequent translocatory disturbances. Among the fungi isolated from the pith and xylem of stocks invaded through the false callus developing round wounds made in the 'heel' during the excision of the buds preparatory to grafting was *Pumilus medullae* [ibid., xviii, p. 294].

Bastisse (E. M.). **Essai de thérapeutique interne du court-noué des Vignes de Champagne par les complexes métallo-siliciques.** [An experiment in internal therapy of court-noué of Champagne Vines by metallo-silicic compounds.]—*C. R. Acad. Sci., Paris*, ccxxiv, 8, pp. 590–592, 1 graph, 1947.

Each year from 1944 to 1946 inclusive, 657 vines in the Möet and Chandon vineyards at Épernay and Mesnil-sur-Oger were given injections in April and June of 26 metallo-silicic compounds (10 per cent. metal) at a dosage of some 3 gm. per stock. Iron, manganese, uranium, and lanthanum proved to be the most effective of the substances tested, while mercury, copper, zinc, and lead were also beneficial. The improvement in the health of the vines was cumulative, becoming more noticeable in the second year. Early treatments gave better results than late ones.

Gilbert (F. A.). **The status of plant growth substances and herbicides in 1945.**—*Chem. Rev.*, xxxix, 2, pp. 199–218, 1946.

Included in this review of 175 contributions (mostly recent) to the knowledge of plant growth substances and herbicides are references to various matters of phytopathological interest. An interesting and untouched problem for further research

is the possibility of a connexion between growth substances and viruses, suggested by the similarity of the formative effects induced in plants by naphthoxy and substituted phenoxy compounds and substituted benzoic acids to those associated with virus infection.

Rapport sommaire sur les travaux de pathologie végétale effectués dans les stations et laboratoires en 1943. Rapport sommaire sur les travaux de pathologie végétale effectués dans les stations et laboratoires en 1944. [Brief report on the plant pathological work carried out in the stations and laboratories in 1943. Brief report on the plant pathological work carried out in the stations and laboratories in 1944.]—*Ann. Épiphyt.*, N.S., xi, 3–4, pp. 245–247, 249–251, 1945. [Received April, 1947.]

In the first of these reports [cf. *R.A.M.*, xxv, pp. 382, 438] it is stated that further comparative spraying tests carried out in 1943 against vine mildew [*Plasmopara viticola*] with different materials containing reduced quantities of copper showed that Bordeaux mixture and similar treatments are still the most effective [cf. ibid., xxv, pp. 488, 537]. Trials at Versailles, Montpellier, and in the south-west of France demonstrated that when copper is readily obtainable, only the older products should be used. Of the new ones, one of the best was Bayer W 2317 [ibid., xxvi, p. 208], which gives adequate protection in years of slight infection, though in ordinary seasons its use is inadvisable. Its fungicidal activity, however, appears to be greater than might be expected from the small amount of copper it contains, and it may prove useful as a supplementary treatment (when copper is short) to Bordeaux mixture. Products containing no copper were useless. Vine court-noué [ibid., xxvi, p. 226] causes appreciable loss in the south of France; an organization should be formed to assist in the selection of healthy vines for planting. Tests in the south-west of France showed that satisfactory control of peach leaf curl [*Taphrina deformans*: ibid., xxv, p. 438] is given by winter disinfection of the trees with reduced amounts of copper; commercial brands of barium sulphide again gave good results. To the materials that can be used for disinfecting cutting-knives against spreading bacterial wilt of potatoes [undetermined: ibid., xxiv, p. 471] is added potassium sodium lye. Poppy wilt was uncommon at Versailles: the disease is probably similar to that attributed to *Helminthosporium papaveris* [ibid., xvii, p. 96] in other countries; infection is favoured by drought.

In the second report it is stated that against vine *Oidium* [*Uncinula necator*: ibid., xxvi, p. 228] commercially pure sulphur (sublimated or triturated) is recommended, sulphur mixed with an inert powder giving results more or less in accordance with the amount of sulphur contained in the mixture. Crushed natural ores containing traces of sulphur had only a very weak effect. Wettable sulphur did not give such good results against *T. deformans* on peach as did Bordeaux mixture and the polysulphides. At Versailles, applications of Bordeaux mixture on 22nd April, 9th May, and 16th June completely controlled *Entomosporium maculatum* [*Fabraea maculata*: ibid., xxii, p. 364] which had been rather abundant on quince during earlier years.

The degree of maturity of potato tubers was ascertained to play a part in the development of *Fusarium caeruleum* [ibid., xxv, pp. 522, 575]. Soil transmission was only of secondary importance in the transmission of potato bacterial wilt. External disinfection of maize seed against smut [*Ustilago maydis*] was unavailing, but hot water treatment at 52° C. markedly reduced the percentage of affected ears, suggesting that the disease results from internal infection of the seed.

Simmonds (J. H.). **Report of the Plant Pathology Section.**—*Rep. Dep. Agric. Qd, 1945–46*, pp. 26–27, 1946.

The officer's report for 1945–6 [*R.A.M.*, xxv, p. 541] states that *Armillaria mellea* [ibid., xxiv, p. 453] on stone fruits is increasing in the Stanthorpe district.

In tests ceresan and agrosan proved better than non-mercurial dusts for groundnut seed treatment [ibid., xxv, pp. 199, 332] in the Kingaroy district. Seed disinfection has kept down crown rot [*Aspergillus* sp.; ibid., xxvi, p. 180] of groundnuts receiving good cultivation. One isolated crop on non-typical soil developed a serious form of the root rot caused by *Sclerotium rolfsii*.

The onion crop in the Lockyer Valley was heavily attacked by downy mildew [*Peronospora destructor*; ibid., xxv, p. 96] resulting in small bulbs from the earlier crops and a reduction in the seed crops. Carrots sustained losses of up to 40 per cent. from crown rot due to soil-inhabiting fungi of the genus *Rhizoctonia*.

URQUHART (D. H.). **Report on the Department of Agriculture, Gold Coast, for the year 1945–6.**—12 pp., 1946.

This report [cf. *R.A.M.*, xxv, p. 253] states that the 1945–6 cacao crop in the Gold Coast amounted to 204,000 tons, as against 285,000 tons for 1935–6. The effect of swollen shoot [ibid., xxv, p. 549] has been most marked in the older cacao-producing areas, especially the Eastern Province, which yielded 70,000 tons in 1945–6 and 116,000 tons eight years before. The amount of disease present increased about tenfold in five years. A preliminary survey begun in 1944 showed that from the original focus a few miles west of Koforidua in the Eastern Province, the main spread has been to the west as far as the Central Province boundary, and north-west up both sides of the Eastern Scarp to Agogo in Ashanti. From an area of infection round Peki, small isolated outbreaks run northwards on both sides of the Volta River. The northernmost outbreak in this chain is some ten miles north-west of Kpandu. In Ashanti, a chain of outbreaks runs from Agogo south-west through Nyabo, Konongo, Lake Bosumtwi area, Bekwai, Akokerri, and Sikamang to outbreaks near Dunkwa. There are also two small isolated outbreaks in the Pamu area. In the Western Province, from the original focus round Wiawso, there has been general spread eastwards to the Ancobra River, down the valley of the Taro River and westward to the French border, near which three secondary foci were found, at the northern tip of the Province where it meets the Ashanti boundary, about 20 miles south of this and 15 miles from the nearest outbreak of the Wiawso group, and round Enchi. An important decision reached in conference was that farmers should be encouraged to plant cacao in areas where swollen shoot has been treated and where conditions particularly suitable to this crop prevail.

The control measures so far carried out in the campaign against the disease have consisted in cutting out all infected trees by severing the lateral roots and cutting the main trunk just below ground-level. This is to be followed by regular re-inspections and the removal of all re-infections.

In the Eastern Province, 101 sq. m. were surveyed and 516 outbreaks recorded, of which 223 were treated. In Ashanti the disease was found to have affected about 800 acres, and about 80 of these were treated. In the Western Province a mild form of the disease occurs which merits special study. Here no cutting-out was done, but a fresh survey was planned, and a number of farms marked out for special observation of this form of the disease.

A survey of the lime-growing areas in the Asebu–Abakrampa area early in 1945 showed the presence of 1,073 lime farms covering some 3,000 acres. A re-survey in November of 10 per cent. of the farms in each age-group showed that the percentage decrease in tree population in the 108 farms was 14·9, or a decrease of 7,680 trees in a little over nine months [cf. ibid., xxv, p. 253]. A further 4·3 per cent. of the trees were very unhealthy or actually dying. The decrease was uniform for farms of all age-groups. It is apparent that a serious widespread decline is occurring in lime farms in all areas and all age-groups. It is considered, however, that neglect and bad cultural practices are almost as important in this connexion as actual disease, which often follows on and is incidental to unsatis-

factory management. Unfavourable soil and climatic conditions must also be reckoned with. Though it has not yet been conclusively established that *Ganoderma lucidum* [loc. cit.] is actively parasitic, there is abundant evidence that it is usually associated with dead and dying groups of trees, infection spreading from a central focus. The presence of this fungus on a farm seems almost invariably to be followed by deterioration of the limes. The species of *Trametes* [loc. cit.] also commonly encountered on half-dead trees appears to be a true saprophyte.

Leaf specimens from healthy limes and from others showing chlorotic symptoms were sent to East Malling for spectrographic analysis. The evidence obtained indicated that some of the trouble may have been due to lime-induced chlorosis. Further investigations are in progress.

At Asuansi Station, grapefruit and other sweet citrus species budded on to sour orange stocks continued to die out, and small hope is entertained for the remaining trees, nearly all of which show the familiar signs of chlorosis and defoliation and an accumulation of starch above the scion-stock union. The sole exceptions are lemon-trees on sour orange stocks, which have remained healthy and yield well.

Chaves Batista (A.). **Principais doenças das plantas em o nordeste.** [Principal plant diseases in the north-east].—*Bol. Agric., Pernambuco*, xiii, 4 pp. 195–252, 19 figs., 1946.

This is the first instalment of a list of the principal diseases of cultivated plants (in alphabetical order of their Portuguese names) in Pernambuco, Brazil, with recommendations for their control. Among the many items of interest are the following. Black rot (*Thielaviopsis* [*Ceratostomella*] *paradoxa*) is a major disease of pineapple, particularly affecting the white and yellow varieties, Red Spanish being one of the more resistant.

Climatic conditions in the north-east preclude large-scale infection of beet leaves by *Cercospora beticola*.

Next to the 'tristeza' form of root rot [see below, p. 298], foot rot, caused in Bahia by *Phytophthora citrophthora*, *P. terrestris* [*P. parasitica*], and *P. parasitica*, is the most important disease of citrus in the regions included in the survey.

Apart from witches' broom [*Marasmius perniciosus*], the predominant pathogen in the cacao plantings of Amazonia [*R.A.M.*, xxiii, p. 379], black pod (*P. palmivora*) is a limiting factor from April to June on the estates of Bahia and Pernambuco, where the losses may exceed 30 per cent. of the crop on densely planted, ill-drained sites.

P. palmivora is also responsible for coco-nut bud rot throughout north-eastern Brazil, where it is uniformly found in association with *Bacillus* [*Bacterium*] *coli* [ibid., i, p. 59; ii, p. 268; iv, pp. 279, 347, 414; ix, p. 88; xi, p. 41]. *Catacauma torrendiella* n.sp. [without a Latin diagnosis] was isolated from coco-nut leaves bearing yellow, later dark-coloured lesions from which arose well-defined, black, stromatic intumescences, often secreting a gummous exudate. Similar structures were observed on the peduncles. The disease is prevalent from Bahia to Parahyba, killing the palms under conditions favouring the causal organism, further details of which are expected to be published.

Bacteriosis due to *Phytomonas manihoti* is the most serious disease of cassava, especially in Bahia, where it was recorded in 1943, milder cases having also been reported from Sergipe, Alagoas, Pernambuco, and Parahyba [cf. ibid., xxii, p. 465].

Fifty-seventh Annual Report of Purdue University Agricultural Experiment Station, Lafayette, Indiana, for the year ending June 30, 1944.—102 pp., 1944. [Received November, 1946.]

The following are among the items of phytopathological interest in this report [cf. *R.A.M.*, xxiii, p. 287].

In the section on plant diseases pp. 56–59, J. A. McClintock states that continued indexing of a 1943 shipment of Manetti rose stocks on seedling stocks has shown that some collections of Manetti stocks may be sources of rose viruses [unspecified] and these findings would justify the indexing of suspicious material in commercial supplies of this stock.

R. W. Samson states that specimens of greenhouse lettuce affected by an unidentified virus disease often show symptoms similar to brown blight, a disease of undetermined origin, and spotted wilt [tomato spotted wilt virus] although the causal agent is not the same. Infected plants are stunted and asymmetrical, the leaves bear dead spots, and the disease is transmissible by rubbing infected juice from one plant on to healthy leaves of another. Up to 60 per cent. severe infection is reported. Aphids [unspecified] transmitted the disease which can be efficiently controlled if these are kept down. The same worker succeeded in reproducing the single-virus streak of greenhouse tomatoes [caused by a strain of tobacco mosaic virus: ibid., xxii, p. 500] by artificial inoculation in the spring of 1944. A more conspicuous mosaic appeared on the younger plants than on the older specimens, which developed a rolling and slight rosetting of the terminal leaves. Typical necrotic streaks appeared on three of the inoculated plants. R. W. Samson and R. M. Caldwell have bred several new canning tomato strains resistant to *Fusarium* wilt [*F. bulbigenum* var. *lycopersici*: ibid., xxv, p. 478]. Field tests have yet to be made but greenhouse tests which wipe out the Rutgers and Pritchard varieties, leave the new strains of Red Currant [*Lycopersicon pimpinellifolium*: ibid., xxvi, pp. 83, 176] parentage uninjured. Promising hybrids resistant to *Septoria* [*lycopersici*: ibid., xxiv, p. 252] have been selected from crosses between *L. hirsutum* and commercial varieties by G. B. Cummins and R. M. Caldwell. Observations by A. J. Ullstrup of backcross progenies of maize from the lines K 61 and Pr, after inoculation with *Helminthosporium carbonum* Race 1 [ibid., xxiii, p. 293], showed that the majority of waxy and sugary kernels gave resistant seedlings while the non-waxy and starchy ones usually produced susceptible plants.

Seven disinfectants were used by R. W. Samson on Katahdin seed potatoes planted in muck soils in 1943. Of these, wettable spergon, fermate, wettable sulphur, and thiosan reduced scab infection of the tubers [*Actinomyces scabies*: ibid., xxiii, p. 241] and new improved semesan bel and yellow oxide of mercury reduced *Rhizoctonia* infection of underground parts of stems [*Corticium solani*: ibid., xxv, p. 79].

In yield and variety tests (p. 62) R. R. Mulvey and A. J. Ohlrogge state that of the disease-resistant oat varieties Tama and Vicland [ibid., xxv, p. 554] gave the highest yields of 57·2 and 56·8 bush. per acre, respectively. Both are resistant to crown rust [*Puccinia coronata*], stem [black] rust [*P. graminis*: ibid., xxv, p. 390] except possibly races 8 and 10, and smuts [*Ustilago avenae* and *U. kolleri*: ibid., xxiv, p. 446], to which Columbia, Gopher, and Cartier are susceptible.

R. M. Caldwell, R. R. Mulvey, and L. E. Compton (p. 67) report that two new spring oat varieties, Benton and Clinton [ibid., xxv, p. 554], have been bred, surpassing all present Indiana varieties in resistance to rusts and smuts, in particular to races 8 and 10 of black rust, strength of straw, acre yield, quality of grain, and adaptability. They are medium, early in maturity, Clinton being of moderate height and Benton medium tall. They were developed from a cross between D 69 (Richland × Green Russian) and Bond. Seed should be available in 1946 to certified producers.

Starr (M. P.). **Studies of phytopathogenic bacteria.**—*Abstr. Thes. Cornell Univ.*, pp. 349–350, 1944. [Received April, 1947.]

In tests to determine the salt tolerance of 203 isolates of phytopathogenic bacteria [*R.A.M.*, xxv, p. 292], it was found that they grew over a wide range of

salt concentration. Characteristic salt tolerances for each of the species tested were observed, indicating the possibility of using this character in taxonomy. The ability of these bacteria to cause brown colorations of synthetic media containing tyrosine may also provide taxonomically useful criteria based on similarities and differences.

The characteristic yellow cell pigment of phytopathogenic bacteria of the genus *Xanthomonas* was shown to consist of two pigments, one predominant and characteristic and the other much less abundant.

Kulescha (Z.). **Production de tumeurs par l'inoculation de Phytomonas tumefaciens dans les fragments de parenchyme vasculaire de Topinambour et de liber de Carotte cultivés in vitro.** [Tumour production by the inoculation of *Phytomonas tumefaciens* into fragments of the vascular parenchyma of Jerusalem Artichoke and of Carrot phloem cultured *in vitro*.]—*C.R. Soc. Biol., Paris*, cxli, 1–2, pp. 24–25, 1947.

Sterile sections of the vascular parenchyma tissue of the Jerusalem artichoke [*Helianthus tuberosus*] and of carrot phloem were sown on a modified Knop's medium and inoculated two days later with suspensions of *Phytomonas* [*Bacterium*] *tumefaciens* from 24- to 48-hour cultures. After five to ten days minute pustules appeared which by the end of three weeks had developed into voluminous tumours of fantastic shape, and in some cases attained a diameter of nearly 2 cm. in a month. In the artichoke sections there was a belated development of callus at a certain distance from the tumours, some of which, moreover, produced roots.

In a parallel series of tests, sections of artichoke tissue were sown on the same medium with the addition of varying concentrations of indoleacetic acid. At 10^{-6} the tumours induced by the heteroauxin developed much less rapidly than those resulting from inoculation with *Bact. tumefaciens*, but the extent of callus formation was approximately equal in both series.

De Ropp (R. S.). **The response of normal plant tissues and of crown-gall tumor tissues to synthetic growth hormones.**—*Amer. J. Bot.*, xxxiv, 2, pp. 53–62, 14 figs., 1947.

Sunflower stem and *Vinca rosea* cambial tissue cultured on White and Braun's medium [*R.A.M.*, xxii, pp. 12, 241] proved to be exceedingly sensitive to the presence of auxins (indoleacetic, indolebutyric, and naphthalene-acetic acids) in the substratum, responding by root production to concentrations of 1 part per 100,000,000 or less. At the high concentration of 1 in 100,000, the hormones stimulated abnormal proliferation in sunflower stem cells, in consequence of which the fragments assumed an external aspect resembling that of crown-gall (*Phytomonas* [*Bacterium*] *tumefaciens*) tumour tissue. Histological examination of this material showed the original stem structure to be still present, the proliferation arising in the original cambium and causing its abnormal extension into masses of long, disconnected cells. When such fragments were transferred and maintained for six months on hormone-free agar the tissue differentiated into roots which subsequently made normal growth.

Crown-gall tumour tissue of sunflower and *V. rosea* [ibid., xxiv, p. 407] underwent no structural alteration when grown in the presence of auxin, though the higher concentrations of the hormones strongly inhibited the development of the excrescences. This absence of response to auxin on the part of tumour tissue provides a further criterion for its differentiation from normal plant tissue. The peculiarity may be attributable to the occurrence in the tissues of some growth hormones of their own production [cf. ibid., xxi, pp. 67, 186]. In the light of new evidence summarized by the writer in *Nature, Lond.*, clvii, pp. 628–629, 1946, the

tissue of grown-gall tumours appears to secrete a substance acting very powerfully on normal tissue growth.

Guyot (A. L.), Massenot (M.), & Saccas (A.). **Études expérimentales sur les rouilles des Graminées et des céréales en 1944. Études expérimentales sur les rouilles des Graminées et des céréales en 1945.** [Experimental studies on the rusts of Gramineae and cereals in 1944. Experimental studies on the rusts of Gramineae and cereals in 1945.]—*Ann. Éc. Agric. Grignon*, Sér. 3, v, pp. 33–80, 213–266, 2 pl., 1946.

From 1942 to 1944 biometrical and biological studies were carried out at the Agricultural College, Grignon, France, on 36 isolates of *Puccinia graminis* [*R.A.M.*, xxv, pp. 388, 389] of which 16 originated on *Triticum* (13 on wheat and one each on *T. turgidum*, *T. dicoccum dicoccoides*, and *T. spelta*), three on *Avena* (two on oats and one on *A. ludoviciana*), four each on rye and *Lolium* spp., two each on barley (one on two-rowed, *H. distichum*), *Aegilops ovata*, and *Arrhenatherum* spp., and one each on *Elymus canadensis*, *Lagurus ovatus*, and *Trisetum flavescens*.

The ratings for maximum infection produced experimentally (using a scale where i represents immunity, 0 extreme resistance, and IV extreme susceptibility) by the *Triticum* isolates were IV on *Aegilops*, barley, and *T.* spp., III+ on *Bromus tectorum* var. *nudus*, III on rye (with two strains only, otherwise i), II on *Lolium perenne*, and i on oats and many Gramineae. Of the wheat varieties tested, hybrid GN (offspring of Hohenheimer 77, K3, Martin, and Oro) proved highly resistant, Oro resistant, and the hybrids GC, GH, and GP, and the Mesnil variety fairly so.

The mean uredospore dimensions on the inoculated wheat plants varied considerably with the origin of the isolate and the identity of the host, the minimum length being 25·4 μ (T_6 on GL) and the maximum 33·7 μ (T_{12} on GA). The most pathogenic strain was T_{13} from Montpellier (average rating of III+) and the least T_9, collected at Grignon (II).

The maximum ratings allotted to the *Avena* [cf. ibid., xxiii, p. 337] isolates were IV on oats and other *A.* spp., III on *Dactylis glomerata* and *Phleum boehmeri*, II on *Bromus macrostachys*, and i on barley, rye, and wheat and many grasses. The mean uredospore dimensions fell well within the range usually ascribed to *P. g. avenae*.

The *Hordeum* strains induced infection rated at IV on barley, wheat, *Triticum dicoccum dicoccoides*, and *T. spelta*, III on *Aegilops ovata*, II+ on *B.* spp., and I on oats and *Avena fatua*, rye, and six genera of grasses. Of the two isolates used, H2 from *H. distichum* was the more aggressive. The mean uredospore measurements ranged from 25·4 by 16·4 to 29·3 by 17·2 μ for H2 on barley, for the same strain on wheat they were 30·5 by 16·8 μ, and for H1 on *T. dicoccum dicoccoides* the corresponding values were 32·6 by 17·6 μ. They indicate that, as other workers have shown, it is not possible to separate the strains on wheat and barley into two subspecies.

The infection ratings for the rye isolates were IV on *Agropyron repens* and rye, III on *Aegilops* spp. and barley, II+ on *Lamarckia aurea*, I on *B. maximus*, 0 on *T. dicoccum dicoccoides* and *T. polonicum*, and I on oats and four grasses. The isolates S_1 and S_2 caused heavy infection on *Agropyron* spp. and spared barley, while with S_3 and S_4 the position was reversed. Nevertheless uredospore measurements of all strains were in agreement with those for *Puccinia g. secalis*.

In respect of pathogenicity and uredospore biometry, the isolates collected on *Aegilops ovata* and *E. canadensis* appear to be very closely akin to the wheat strains. The *A. ovata* (Æ) strains induced infection rated at IV on *A. trianistata* and the Bon Fermier, Noé, Vilmorin 23, and Aurore wheat varieties, IV— on barley (including *H. distichum*), III— on *B. intermedius*, I on rye, 0+ on *Lolium linicola*, and i on oats. The mean uredospore dimensions ranged from 25·7 by 15·9 μ on *B. tectorum*

to 32·6 by 18·3 μ on Vilmorin wheat. The ratings for the *E. canadensis* (E) strain were IV— on wheat and *T.* spp., III— on its own host, II+ on rye, II on *H. distichum*, and II— on oats. The mean uredospore measurements were 33·4 by 17·6 μ on *E. canadensis*, 28·3 by 17·3 μ on *H. distichum*, 30·9 by 17·6 μ on rye, and 31·9 by 17·6 μ on Aurore wheat. The maximum infection ratings induced by the two *Arrhenatherum* (A_1) strains, which were quite different in pathogenicity, were IV— on *L. linicola*, III on *A.* spp., oats, and *Phleum pratense*, III— on *B. rubens*, II on rye, and i on barley (including *H. distichum*), *H. murinum*, and wheat. Isolate Ar 1 from *A. avenaceum* attacked rye and *L. perenne* but not oats, whereas Ar 2 from *A. bulbosum* was pathogenic to oats but not to rye or *L. perenne*. The maximum mean uredospore dimensions were 27·5 by 15·4 μ on *L. perenne*.

A strain collected on *Lagurus ovatus* induced grade IV infection on Vilmorin 23 wheat on which the uredospores measured 30·3 by 18·2 μ, but was transmissible only with difficulty to its own host (i–0).

The maximum infection ratings for the four *Lolium* isolates were IV on *L.* spp., III on *B.* spp., *D. glomerata*, and winter barley, III— on *Festuca gigantea*, II–III on *Lagurus ovatus*, II on *Avena fatua*, *P. arenarium*, and rye and 0 on wheat. The maximum uredospore measurements were 26 by 14·7 μ on *Lolium temulentum*. Isolates L1 and L2, which appear earlier in the field (23rd June and 9th July in 1943), are virtually non-pathogenic to oats and wheat but cause moderate to fairly severe damage on rye and barley, whereas the later developing L3 and L4 (23rd July, 1943 and 9th August, 1944) are more or less innocuous to all the cereals.

The strain from *Trisetum flavescens* (Tr 1) gave infection ratings IV on oats, III on *Arrhenatherum avenaceum*, II on *B. maximus*, 0+ on *B. sterilis* and *B. tectorum*, and i on barley (including *H. distichum*), rye, and wheat. The uredospore dimensions on oats were 27 by 16·4 μ. Tr 1 appears to be closely related, both biologically and biometrically, to Ar 2. Notes are also given on the prevalence in the field of *Puccinia glumarum*, crown rust [*P. coronata*], and *P. triticina*.

Twelve of the 65 isolates of *P. graminis* studied in 1945 were collected on wheat or *Triticum* sp., 9 each on *Agropyron repens* or *A. caninum* and *L. perenne*, 8 on barley (including *H. distichum*) or *H. murinum*, 7 on oats, *Avena fatua*, or *A. ludoviciana*, 3 on *D. glomerata*, 2 each on rye, *Arrhenatherum avenaceum*, *E. canadensis*, *F. arundinacea*, and *Poa trivialis*, and 1 each on *B. maximus*, *B. macrostachys*, barberry, *Aegilops crassa*, *Agrostis alba*, *Anthoxanthum odoratum*, and *Vulpia myuros*. The isolates from *Aegilops crassa*, *B.* spp., *E. canadensis*, *H.* spp., and *V. myuros* were referred to the subspecies *tritici* of *Puccinia graminis*.

The maximum infection ratings induced by the *T.* strains were IV on *Aegilops crassa* and wheat, III+ barley, III on *Agropyron caninum*, II+ on *B.* spp. and rye, and i on *L.* spp. A high degree of resistance was shown by GN, Oro, and Thatcher wheat, GP, Heines Kolben, and Warren were resistant, and GC, GH, and Hope moderately so. Strains isolated early in the season, particularly those taken at the first appearance of the rust, were the most highly pathogenic.

Particular interest attaches to the wheat isolate 123 from the Manche which was absolutely non-pathogenic to the otherwise highly susceptible Dômes, Franc Nord, and Yga varieties, and caused only slight infection on Marquillo and Riéti, likewise susceptible to the other strains; on the other hand, it severely attacked GN, Oro, Warren, and Thatcher, immune from, or highly resistant to, the remainder of the isolates tested. Five other strains showed a marked tendency to physiologic specialization. The mean uredospore dimensions of most of the *T.* isolates ranged from 29·9 to 31 by 16·8 to 17·8 μ, the minimum and maximum lengths of 25·1 and 34·1 μ occurring on the Warren and P'tit Quinquin wheat varieties, respectively, and the corresponding widths of 15·3 and 19·4 μ on Kanred and R. Leblond respectively.

Infection induced by *Avena* strains was rated as follows: IV on oats and other *A.* spp., and *V. myuros*, IV— on *Lagurus ovatus*, III on *Arrhenatherum avenaceum*,

B. intermedius, *D. glomerata*, and *F. ovina*, II+ on barley, *Koeleria cristata*, and *Lolium temulentum*, I+ on *H. distichum*, I on *Agropyron caninum*, and i on many grasses. All the varieties of oats tested were highly susceptible, especially Avoine grignonnaise. The mean uredospore dimensions were of the range usual for *P. g. avenae*.

The ratings of maximum infection induced by the *Hordeum* isolates were IV on wheat, III on *B. maximum* and *H. distichum*, II+ on barley, I on *Aegilops triaristata*, 0+ on *H. murinum*, 0 on *Agropyron caninum*, and i on *L.* spp. In general, the isolates from *H. murinum* and cultivated barley were of comparable pathogenicity. Again the forms *hordei* and *tritici* of *Puccinia graminis* appeared to be indistinguishable.

The *Agropyron* and rye isolates induced infection rated at IV on rye and wheat, III+ on *A. caninum* and *H. distichum*, III− on barley and *L. perenne*, II+ on *B. tectorum* and *L. temulentum*, II on *H. murinum*, I on *Aegilops ovata*, and i on oats and some grasses. A study of the parasitic characters of the aecidial forms developing spontaneously on barberry revealed their identity with *P. g. secalis*. The mean uredospore dimensions ranged from 24·3 to 28·4 by 15·2 to 17·1 μ on *B. tectorum* to 26·9 to 31·2 by 15·5 to 18·4 μ on *T. dicoccoides*. Some of the *Agropyron* isolates differed markedly in pathogenicity from those referred to *P. g. secalis*, being almost or quite innocuous to rye, barley, and wheat.

The isolate from *Agrostis alba* produced infection of type II on *L. temulentum* and *V. myuros*, I on *Corynephorus canescens*, and i on oats and several grasses. The mean uredospore dimensions ranged from 22·3 by 13·6 μ on *Agrostis alba* to 24·2 by 14·5 μ on *V. myuros*.

The *Anthoxanthum odoratum* strain attacked various grasses but not the cultivated cereals. The minimum uredospore measurements were 24·1 by 15·1 μ on *V. myuros* and the maximum (length) 25·9 by 15·3 μ on *B. macrostachys* and (width) 25·1 by 16·7 μ on *A. odoratum*.

On the basis of their pathogenicity, one of the two new isolates from *Arrhenatherum avenaceum*, Ar 4, was referred, together with Ar 2 from 1944, to *Puccinia g. avenae*, while the other, Ar 3, was classed with Ar 1 as a distinct form, inducing reactions of type IV on *L. temulentum*, III on *L. perenne*, II on rye, and i on oats and wheat.

The strains isolated from *B. macrostachys* and *B. maximus* were morphologically and biologically indistinguishable from *P. g. tritici*, a close relationship with which was indicated in those from *E. canadensis* and *Aegilops crassa*. The three *D. glomerata* strains were unable to attack oats.

Among the infection ratings for the *Lolium* strains were IV on *Lagurus ovatus*, IV− on *D. glomerata*, III+ on *T. dicoccum dicoccoides*, III on rye, winter barley, *Avena fatua*, and *Phleum arenarium*, II+ on barley, II on *F. arundinacea*, and i on oats and wheat. The forms developing early in the season approximate closely to *P. g. tritici* in their biological and biometrical characters, whereas those appearing later are more divergent.

The *Poa trivialis* isolate could not be differentiated from *P. g. avenae*, while the strain collected on *V. myuros* agreed in essentials with *P. g. tritici*.

Wheat and rye were found to be very susceptible and barley slightly so to a strain of brown rust (*P. triticina*) collected on *Aegilops*. *A. squarrosa* and *A. triunciale* were very susceptible to *P. triticina* from wheat, which was almost innocuous, on the other hand, to *A. crassa*, *A. ovata*, and *A. triaristata*, as well as to barley and rye.

Uppal (B. N.) & Gokhale (V. P.). **A new race of Puccinia graminis tritici and two biotypes of race 42.**—*Curr. Sci.*, xvi, 2, p. 61, 1947.

In the course of tests to determine the reactions of wheat varieties and hybrids

to black rust (*Puccinia graminis tritici*) at Mahabaleshwar, it was observed that certain types showing high or moderate resistance in the seedling stage to all seven races of the pathogen occurring in India, viz., 15, 21, 24, 34, 40, 42, and 75 [*R.A.M.*, xx, p. 292], developed large pustules in field trials for mature-plant resistance. From these pustules three isolates were obtained and tested on the differential wheat varieties. One induced reactions differing entirely from those associated with any of the 189 races of black rust described by Stakman *et al.* [ibid., xxiv, p. 272]. It is, however, similar to race 119 except for its effects on Khapli, which is highly resistant (1-type infection) to the latter but moderately susceptible (3 to 4) to the new race under the prevailing experimental conditions.

The other two isolates proved to be biotypes of race 42 and are designated A and B. The former induced type-4 symptoms on Khalpi, which responds to the race proper and also to biotype B by those of type 3. Biotype B is readily distinguishable from race 42 by its effects on five other differential varieties tested, namely, F × 3 (race 42 causing 2- to 3-type of infection, and B 4), C. 6014 (0 to −2 and 3, respectively), C. 14098 (0 and 4), E. 220 (0 and 3+), and Hofed 1 (0 and 3+), the corresponding grades for biotype A being 3, 2, 2, 2, and 2, respectively.

Ausemus (E. R.) & Bamberg (R. H.). **Breeding hard red winter Wheats for the northern Great Plains area.**—*J. Amer. Soc. Agron.*, xxxix, 3, pp. 198–206, 1947.

Of a large number of selections from crosses between winter wheats and the spring varieties Hope and H-44 tested in plot and nursery trials in Minnesota, strains were obtained giving a relatively satisfactory performance in respect of yield, winter-hardiness, resistance to leaf [brown] and stem [black] rusts [*Puccinia triticina* and *P. graminis*], and milling and baking qualities [*R.A.M.*, xxv, p. 298]. Several Hope and H-44 × Minturki hybrids, for instance, showed only a trace of black rust and low percentages of brown.

In Montana progress is being made in the breeding of hardy winter wheats combining resistance both to ordinary and dwarf bunt (*Tilletia caries*) [loc. cit.].

Vallega (J.). **Reacción de algunas especies espontáneas de 'Hordeum' con respecto a las royas que afectan el Trigo.** [Reaction of some wild *Hordeum* species in respect of the rusts attacking Wheat.]—*Rev. Invest. agríc., B. Aires*, i, 1, pp. 52–62, 1947.

The wild *Hordeum* species prevalent in the cereal-growing regions of Argentina are frequently attacked by the wheat rusts, *Puccinia glumarum*, *P. rubigo-vera tritici* [*P. triticina*: see next abstract], and *P. graminis tritici* [*R.A.M.*, xxii, p. 424; xxiii, p. 255; xxv, p. 257]. *H. murinum*, *H. leporinum*, and *H. spontaneum* proved highly susceptible in inoculation experiments with *P. glumarum* from wheat, *H. pusillum* var. *typicum* susceptible, and *H. compressum* moderately so, while the responses of *H. pusillum* var. *euclaston* and *H. jubatum* var. *pampeanum* were variable, some plants readily contracting infection while others resisted or escaped it.

H. murinum and *H. leporinum* were resistant to races 20 and 62 of *P. triticina*, while *H. pusillum* and its vars. *typicum* and *euclaston*, *H. stenostachys*, *H. compressum*, and *H. jubatum* were virtually immune. The wild barleys, therefore, appear unlikely to play an important part in the spread of brown rust in Argentina.

On the other hand, all the above-mentioned varieties showed some degree of susceptibility to races 11, 15, 17, and 42 of *P. graminis tritici*, *H. jubatum* var. *pampeanum*, in particular, contracting heavy infection. This species, together with *H. pusillum* var. *euclaston*, next in order of susceptibility, may well serve as one of the principal sources of diffusion of black rust in the country. The susceptibility of *H. jubatum* to *P. g. tritici* in Argentina is markedly at variance with its resistance to the rust in Australia reported by W. L. Waterhouse [ibid., ix, p. 438].

Favret (E.). **Presencia de la raza 15 de 'Puccinia rubigo-vera tritici' en la Argentina.** [Presence of race 15 of '*Puccinia rubigo-vera tritici*' in Argentina.]—*Rev. Invest. agríc., B. Aires*, i, 1, pp. 63–64, 1947.

Race 15 of wheat brown rust (*Puccinia rubigo-vera tritici*) [*P. triticina*: see preceding abstract] was detected in a sample from the Province of Buenos Aires in 1944. Its importance lies in its pathogenicity to all the varieties at present under cultivation, including Sinvalocho, and its extreme virulence on the selection Klein H. 211 (Progress × Apulia), which is resistant to the other races of *P. triticina* occurring in Argentina and has been extensively used in breeding work.

Arnaud (G.). **La carie du Blé. Questions d'hier et d'aujourd'hui.** [Wheat bunt. Questions of yesterday and to-day.] –*Ann. Épiphyt.*, N.S., x, Fasc. unique, pp. 1–9, 1944. [Received February, 1947.]

In view of the shortage of copper compounds for the treatment of wheat seed against bunt [*Tilletia caries* and *T. foetida*: *R.A.M.*, xxiv, p. 459; xxvi, p. 150] at the time of writing, the author gives directions for the use of other materials and lists the results obtained in 1942–3 in official tests with numerous preparations many of which gave satisfactory protection. He states that it is better to sow the susceptible Vilmorin 27 variety than to resort to resistant varieties, which are so much less productive. The recommended treatments fall into four groups, (1) copper salts (wet: copper sulphate 5 gm. per l. followed or not by dusting with lime; or 2 per cent. Bordeaux mixture; and dry: copper chloride, copper carbonate, copper oxychloride, neutral copper acetate, and various cupric products reducible to fine powders), (2) formalin for steeps and trioxymethylene for dusting, (3) organo-mercuric compounds, and (4) salicylic acid. If none of these materials is obtainable growers are advised to use only seed obtained from clean plants, to wash it with the utmost care in water, and then soak it for three hours in a mixture of 2 per cent. milk of lime and 2 per cent. sea-salt or in sodium sulphate 2 per cent. Potassium permanganate is not recommended.

Lansade (M.). **Essais de lutte contre la carie du Blé (Tilletia tritici (Bjerk.) Wint) en 1943 et 1944.** [Tests on the control of Wheat bunt (*Tilletia tritici* (Bjerk.) Wint.) in 1943 and 1944.]—*Ann. Épiphyt*, N.S., xi, 3–4, p. 177–189, 1945. [Received April, 1947.]

Experiments on the effect of a large number of compounds on the control of wheat bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, xxvi, p. 11 and preceding abstract] carried out over a period of several years showed that copper salts are effective. Bordeaux mixture 1·5 or 2 per cent. (1 per cent. is too weak) is recommended, the seed being immersed for 20 minutes; if necessary, resort can be had to sprinkling and vigorous shovelling, using 8 to 10 l. liquid per 100 kg. seed. Copper nitrate used similarly gives comparable results. A simple solution of copper sulphate 0·5 per cent. can be used, the seed being soaked for 20 minutes and then dusted with lime. If higher concentrations are employed, there is a risk of reduced germination.

Cupric dusts, at the rate of 200 or 250 gm. per 100 kg. seed, may also be used, but their effectiveness depends on their nature, copper content, fineness, etc. It is best to use the pure product; if this cannot be done, a content of at least 25 per cent. copper is essential.

Formalin, at the rate of $\frac{1}{4}$ or $\frac{1}{3}$ l. of commercial solution per 100 l. water, stirred for 20 minutes, is a very active material; the seed must not be dried, and should be sown without delay. Dusts with a trioxymethylene base should contain at least 50 per cent. or more of the active ingredient. In most cases organic mercury derivatives gave satisfactory results. In two years' trials hexachloro-benzene proved highly satisfactory [ibid., xxvi, p. 150.]

Björling (K.). **Melanism hos olika Vetesorter.** [Melanism in different Wheat varieties.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946*, 6, pp. 85–91, 5 figs., 1946.

During the last five years, wheat has been affected in Scania, Sweden, by a disorder occupying an intermediate position as regards symptoms between two physiological defects described from Canada, one by Broadfoot and Roberston under the name of 'pseudo-black chaff' [*R.A.M.*, xii, p. 561], and the other by Hagborg as 'internodal melanism' [ibid., xvi, p. 91]. Of 486 samples examined at the Åkarp branch of the Plant Protection Institute, only three (1942) yielded a parasitic fungus, *Septoria nodorum*. Saprophytes, with *Pullularia pullulans*, *Hormodendrum cladosporioides*, and yeasts predominating, developed in pure culture from about 60 per cent. of the discoloured tissues and 25 per cent. of the controls from healthy plants, while greyish-white, rod-shaped bacteria were also isolated in a few plates from both sources and inoculated into wheat seedlings with negative results.

In an experiment to determine the possible effect of soil amendments on melanism, the application of nitrogen, alone or as part of the complete fertilizer, caused an increase of 79 per cent. in internodal melanism over the amount developing in the plots given phosphate and potash or only the former.

Bellod (M.). **Notas sobre el 'mal de pie' del Trigo en la huerta valenciana.** [Notes on Wheat 'foot rot' in the Valencian irrigated zone.]—*Bol. Pat. veg. Ent. agríc., Madr.*, xiv, pp. 55–68, 9 figs., 1946.

In normal times cereals are not widely cultivated in the irrigated zone of Valencia, but from 1939 onwards the prevailing scarcity of wheat and the Government scheme of bonuses for growers resulted in a radical change in the local crop sequence. In 1943, for the first time, inquiries reached the Levante Station of Agricultural Phytopathology concerning the wheat foot rot caused by *Ophiobolus graminis*, which was found to cause widespread damage, notably to the popular Mentana and Ardito varieties, some fields being an almost total loss while the average reduction would amount to about one-third of the entire crop. The Fartó variety of *Triticum durum* seemed to be much more resistant.

A comparative analysis of four ears each from healthy and diseased plants showed the length of the former to range from 110 to 125 and of the latter from 69 to 95 mm., the number of seeds from 59 to 77 and from 18 to 30, respectively, while the average weights of the seed from the healthy and infected ears were 3·1187 and 0·1987 gm., respectively.

O. graminis is most prevalent on clay or clay-siliceous soils and thrives in the presence of excessive moisture, the accumulation of which in the upper layers may be obviated by a conservative system of irrigation, watering as a rule only once when the seedlings start rapid growth and again when the ears begin to expand. Other indirect control measures should include leaving a good growth of stubble, 20 to 30 cm. in height, for burning after the harvest, and two cross-ploughings to a sufficient depth to eradicate as much as possible of the roots and surrounding soil.

Thren (R.). **Über Zustandekommen und Erhaltung der Dikaryophase von Ustilago nuda (Jensen) Kellerm. et Sw. und Ustilago tritici (Persoon) Jensen.** [On the development and maintenance of the dikaryophase of *Ustilago nuda* (Jensen) Kellerm. & Sw. and *Ustilago tritici* (Persoon) Jensen.]—*Z. Bot.*, xxxvi, 10, pp. 449–498, 2 pl., 13 figs., 1941. [Received 1946.]

In this exhaustive cytological study the author fully describes and discusses the processes involved in the development and maintenance of the dikaryophase in

the loose smuts of barley and wheat (*Ustilago nuda* and *U. tritici*, respectively) [cf. *R.A.M.*, xvi, p. 804.]

JENSEN (N. F.). **Powdery mildew of Barley. Studies of yield losses and the inheritance of disease resistance.**—*Abstr. Thes. Cornell Univ.*, pp. 333–334, 1944. [Received April, 1947.]

Powdery mildew [*Erysiphe graminis*; *R.A.M.*, xxvi, p. 194] of barley threatens to cause serious harm to the crop, especially in New York State. The investigations were carried out with race 4 of the pathogen and extended over the three-year period, 1940–42, at Cornell University Agricultural Experiment Station. When sulphur dust was used as a protectant (20 lb. per acre), the reduction in yield in the susceptible varieties used was statistically significant, the losses in 1941 being 19, 15, and 10 per cent. and the greatest loss 5·8 bush. per acre. The 1942 statistically significant losses were 42, 38, 33, and 29 per cent. on the susceptible varieties, the greatest reduction being 23 bush. per acre. Resistant varieties showed no significant loss. A new physiologic race which attacks Goldfoil, highly resistant to race 4, is so far confined to the greenhouse where it appeared. Two crosses, resistant Goldfoil × susceptible Wisconsin No. 38 and Ohio No. 3144 × Goldfoil, were studied for resistance to race 4; resistance and susceptibility were found to depend on a single pair of factors, susceptibility being incompletely dominant [ibid., xxiv, p. 224].

MACFARLAN (J.) & GRAINGER (J.). **Corn mildew on Oats.**—*Scot. J. Agric.*, xxvi, 4, pp. 211–215, 1 pl., 1 graph, 1947.

Powdery mildew of oats (*Erysiphe graminis*) [*R.A.M.*, xxv, p. 403], which is occasionally very severe on cereals grown for green fodder in the west of Scotland, was considered in relation to the effects of climate, major factors of soil nutrition, and major constituents of the host plant.

Oats were grown on two sites with the same average temperature but having different relative air humidities, one being very humid (100 per cent. relative humidity for long periods). The crop on the latter site had three times as much mildew as that on the drier site. Spores germinated better in saturated air than in water or unsaturated air, while below 90 per cent. relative humidity they failed to grow [ibid., xxv, p. 280]. There was heavy mildew infection during the mainly fine summer of 1944, when, however, there were long periods of high relative humidity, and slight mildew during 1945 with mainly dull weather but low relative humidity for most of the growing period. A close relation was found between percentage infection and the number of hours of 100 per cent. humidity. The strains of *E. graminis* are specific to each type of cereal and probably have different climatic reactions.

Field experiments on phosphate-deficient soil of the effects of nitrogen, phosphate, and potash fertilizers [ibid., xxv, p. 523] showed that unbalanced applications of both nitrogen and potash increased mildew infection (from 14 to 26 per cent.), phosphate alone benefiting the crop by reducing mildew from 14 to 10 per cent. Pot experiments confirmed that it is only correction of phosphate deficiency which reduces the severity of the mildew, phosphate applications to normal soils having no effect.

The only point of interest emerging from the third problem was that oats appeared more susceptible to *E. graminis* when grown with eight hours' illumination per day than with the normal length of day.

It is recommended that manurings should be balanced and not excessive, serious phosphate deficiency corrected, and the oats grown in open, airy positions with low relative humidity.

Ekstrand (H.). **Några växtpatologiska synpunkter på höstsädes- och vallodlingen i Norrland.** [Some phytopathological aspects of autumn cereal seed- and pasture grass-cultivation in Norrland.—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946*, 5, pp. 68–73, 1946.

During the last few decades the cultivation of autumn cereal seed has declined to an unprecedented extent in the north of Sweden, but it could doubtless be rehabilitated by the introduction of varieties resistant to the fungal diseases responsible for winter injury. Rye was formerly much more widely grown than it is to-day, but the 'rustic' varieties in common use, though resistant to *Fusarium* [*Calonectria graminicola*], were of unattractive growth habit and relatively unproductive.

The cultivation of clover in the northernmost parts of the country is often considered impracticable, partly by reason of the poor state of the soil and partly on account of clover rot [*Sclerotinia trifoliorum*]. The resistance shown to the pathogen in the south by the Svalövs Merkur and Weibulls Resistenta selections has not been maintained elsewhere, indicating the predominance of different physiologic races in the various regions [*R.A.M.*, xxvi, p. 155].

Mention has already been made of the depredations caused by *S. borealis* among pasture crops in the far north [ibid., xxvi, p. 10]. In a test near Luleå in the spring of 1946 on 1945 meadow fescue [*Festuca pratensis*] seed of northern (Luleå) and southern (Svalöv) provenance, the incidence of infection by this fungus ranged from 11·5 to 15 per cent. for the former and from 22·5 to 52·5 per cent. for the latter. In a test on *F. rubra* of the same year the two southern (Scania) lots developed 31·5 and 35 per cent. infection and the two northern (Luleå) 10 and 9·1. *Typhula borealis* [loc. cit.], the sole pathogen of grasses in the same locality in 1945, was also more prevalent on timothy [*Phleum pratense*] of southern origin than on the north Bothnian selections. It is obviously advisable, therefore, that seed for pasture crops should be locally produced.

Sabet (Y. S.). **Reaction of Citrus mycorrhiza to manurial treatment.**—*Proc. Egypt. Acad. Sci.*, i, 1, pp. 21–28, 6 figs., 1946.

Lime, sweet and sour orange, lemon, grapefruit, mandarin, and citron trees at Giza were found to harbour endotrophic mycorrhiza, which responded to the application of soil amendments similarly to those described by Reed and Frémont from California [*R.A.M.*, xiv, p. 710]. Farmyard manure stimulated the production of copiously branching arbuscules, which were scantier and smaller in the roots supplied with calcium nitrate and still further reduced in the untreated control rows.

The examination of chlorotic orange trees raised from seed revealed sparse endophytic infection compared with the extensive mycorrhizal investment of the cells in healthy roots and those of trees that had recovered from the disturbance following the injection of iron salts or the admixture of organic manure with the surrounding soil.

The views of other workers on the significance of the mycorrhizal association are summarized and discussed. Most of the papers referred to have been noticed from time to time in this *Review*.

Dickson (R. C.) & Johnson (Metta McD.). **Insect investigations in relation to quick decline.**—*Calif. Citrogr.*, xxxii, 4, pp. 159, 162, 1947.

The work being carried out by the authors on the possible transmission of the virus of citrus quick decline [*R.A.M.*, xxvi, p. 242] by insects consists of a survey of the insects present in orange trees and which therefore might transmit the virus, an attempt to retard the spread of quick decline in an orange grove by the use of

insecticides, and transmission tests to determine which insect might be involved in spreading the virus. Results are not expected for 18 months at least.

Sobrinho (V.). **A tristeza dos Citrus. Hipotese fisiológica.** [Citrus 'tristeza'. A physiological hypothesis.]—*Bol. Agric., Pernambuco*, xiii, 4, pp. 253–264, 1 fig., 1946. [English summary.]

Of the three symptoms of the 'tristeza' form of citrus root rot (which the author identifies with quick decline) [see preceding abstract], observed in north-eastern Brazil [see above, p. 287], namely, sieve-tube occlusion, root rot in the stock, and decay of the scion, only the first-named is a direct consequence of intervention by a virus or other extraneous agency, the rotting of the roots being a secondary effect and the decay of the scion a tertiary. The wood vessels both of stock and scion are sound, as also are the sieve-tubes, except in the grafting region where the occlusions occur.

The causal organism, if any, must therefore be sought in the sieve-plates or tissues adjoining the sieve-tubes round the juncture between scion and stock [cf. next abstract].

Meneghini (M.). **Sôbre a natureza e transmissibilidade da doença 'tristeza' dos Citrus.** [On the nature and transmissibility of the 'tristeza' disease of Citrus.] —*Biológico*, xii, 12, pp. 285–287, 1946.

The author tabulates and briefly discusses the results of experiments at the Biological Institute, São Paulo, Brazil, in the transmission of the 'tristeza' form of citrus root rot [*R.A.M.*, xxvi, p. 12 and preceding abstract] by means of the black orange aphid, *Aphis* (?) *tavaresi*. In 1945 the disease was conveyed by aphids collected on affected sweet orange plants to one out of four Pêra sweet orange scions on bitter orange stocks in a test performed on 20th February, clear-cut symptoms developing on 15th May; to one out of four in a test on 14th May with aphids from mandarin, the symptoms appearing on 30th August; to one out of five in a test on 6th June, in which the aphids were placed direct on the scions (symptoms on 6th September); to one out of two with aphids fed on a diseased sweet orange plant (21st July, symptoms 28th November); and to one out of 30 of the Caipira, Pêra, Barão, and Lima varieties with aphids from diseased sweet orange (6th November, symptoms 2nd February, 1946).

In a test on 2nd August, 1946, aphids from affected sweet orange plants transmitted the root rot to one out of two Pêra scions and to both those of Barão used, symptoms being observed on 16th December. Two out of three Caipira scions visited by aphids from sick mandarins on 2nd September also displayed root-rot symptoms on 16th December.

Wallace (J. M.). **The use of leaf tissue in graft-transmission of psorosis virus.**— *Phytopathology*, xxxvii, 3, pp. 149–152, 1 fig., 1947.

In the inoculation of citrus with the psorosis virus by means of leaf-tissue grafts, resulting in 90 to 100 per cent. infection, the procedure is similar to that previously described by the author for the insertion of bark patches [*R.A.M.*, xxiv, p. 501]. The fusion of tissues was rapid, symptoms appearing on the inoculated seedlings in two to four weeks. Many of the leaf pieces were still living and of normal colour after 30 months under the bark, by which time they were buried in 3 to 4 mm. of wood.

Heim (R.). **Une aspergillose du grain de Café.** [An aspergillosis of the Coffee berry.] —*C.R. Acad. Agric. Fr.*, xxxii, pp. 407–411, 1946.

From coffee (*Coffea arabica*) berries from Costa Rica with a soapy, whitish

appearance the author isolated an *Aspergillus* which from its cultural characters belonged to the *ochraceus* group and appeared to be referable to *A. tamarii*. The fungus develops on berries treated by the wet method, and since 1935 has been more and more prevalent on coffee from the same source. The disease appears to be induced by imperfect drying or excessive humidity during fermentation. As, according to the author, most of the fungi of this group cause pulmonary diseases which may prove fatal, it is considered that coffee berries infected by this organism should not be used.

Ergle (D. R.) & Blank (L. M.). **A chemical study of the mycelium and sclerotia of Phymatotrichum omnivorum.**—*Phytopathology*, xxxvii, 3, pp. 153–161, 1 graph, 1947.

The chemical composition of the sclerotia of *Phymatotrichum omnivorum*, the agent of cotton root rot [cf. *R.A.M.*, xxi, pp. 75, 287], was determined at four stages of growth in culture on (*a*) Houston Black clay, high-lime phase, (*b*) the same, low-lime phase, and (*c*) Wilson clay. The development of the sclerotia was found to be accompanied by a proportionate disappearance of reducing sugars and an accumulation of fat, protein, glucosans, and hemicelluloses. Parallel with a higher growth rate, glucosans and protein tended to accumulate in higher concentrations in sclerotia produced in the two Houstons than in the Wilson soil. Non-reducing sugars, pectin, pentosans, cellulose, and suberin were present in the sclerotia in relatively small amounts irrespective of the soil type.

The mycelium of *P. omnivorum*, cultured in a suitable nutrient solution, contained higher concentrations of fat, protein, and reducing sugars than the sclerotia but was materially less efficient than the latter in the storage of total carbohydrates (sugars plus glucosans plus hemicellulose). Ash, pectin, pentosans, cellulose, and suberin were also more abundant in the mycelium than in the sclerotia.

At neither stage in the life-history of the fungus was starch or sucrose present, whereas glycogen was identified both in the sclerotia and mycelium: a disaccharide, believed to be trehalose, occurred in the former only. Apart from small quantities of pentosans, the polysaccharides in both phases seemed to consist mainly of polymers of glucose.

Yang (J. Y.) & Ling (L.). **Diseases of Cotton in Szechuan.**—*Bull. Szechuan agric. Improvement Inst.* 1, 12 pp., 7 figs., 1942. [Chinese. Received 1946.]

According to a survey made from 1937 to 1941, 19 diseases attacking cotton were found in Szechuan [*R.A.M.*, xxiv, p. 100]. These, in the order of destructiveness, are as follows: bacterial blight (*Bacterium* [*Xanthomonas*] *malvacearum*), anthracnose (*Glomerella gossypii*), *Fusarium* boll rot (*F.* spp.), *Diplodia* boll rot (*D. gossypina*), stem canker (cause unknown), sore shin (*Rhizoctonia* [*Corticium*] *solani*), stem blight (*Alternaria macrospora*), *Colletotrichum* boll rot (*C. indicum*), *Alternaria* leaf spot (*A.* spp.), *Phyllosticta* leaf spot (*P. gossypina*), areolate mildew (*Mycosphaerella areola*), wilt (*F. vasinfectum*), sclerotial stem rot (*Sclerotium rolfsii*), *Mycosphaerella* leaf spot (*M. gossypina*), *Cephalothecium* boll rot (*C.* [*Trichothecium*] *roseum*), *Aspergillus* boll rot (*A.* sp.), and *Phytophthora* boll rot (*P.* sp.).

Detailed records of the distribution and relative prevalence of each disease in different seasons are given. A key for field identification is provided. The loss of seed cotton due to the important diseases was estimated at approximately 5,250 metric tons in 1938, 2,200 in 1939, and 5,000 in 1940.

Varietal resistance towards bacterial blight and anthracnose were recorded, and a list of resistant varieties, mostly Chinese, is given.

Ling (L.), Foo (C. F.), Lin (H. D.), & Wang (H. C.). **Combating Cotton diseases in Szechuan.**—*Rep. Szechuan agric. Improvement Inst.*, 12 pp., 1 fig., 1942. [Chinese.]

From 1939 to 1941, the control of cotton diseases in northern Szechuan was carried out by spraying with Bordeaux mixture twice during the growing season in July and August. The results obtained from 81 demonstration plots during the three-year period showed that the spraying effected an average increase of yield of 14·8 kg. seed cotton per shih mow [1 shih mow = $\frac{1}{6}$ acre] over the check at a cost of about $\frac{1}{5}$ of the gain.

Gorlenko (M. V.). **The toxins of moulds.**—*C.R. Acad. Sci. U.R.S.S.*, liv, 5, pp. 449–451, 1946.

Besides *Strachybotrys alternans*, the agent of a virulent disease of horses in the Ukraine [*R.A.M.*, xxiv, p. 276], nine other ubiquitous moulds obtained from the air of cotton mills, from cotton-wool, and fodder samples, including *Alternaria tenuis* and *Macrosporium* [*A.*] *gossypii*, were experimentally shown to be more or less pathogenic to rabbits. Though the toxicity of the other organisms is lower than that of *S. alternans*, their growth is more rapid and prolific. The minimum doses of toxin of *S. alternans* required to induce slight and severe lesions, respectively, in rabbits' eyes were 0·0000064 and 0·00016 [? gm.] of the dry substance extracted, respectively. All the toxins are readily soluble in acetone, ether, alcohol, and dichlorethane, but not in water. They are endotoxins, confined within the mould itself and not diffusing into the substratum, a matter of some practical importance, inasmuch as contaminated fodder can be freed from the superficial moulds and rendered fit for consumption, e.g. by washing.

Doty (M. S.) & Slater (D. W.). **A new species of Heterosporium pathogenic on young Chinook Salmon.**—*Amer. Midl. Nat.*, xxxvi, 3, pp. 663–665, 1 fig., 1946.

In California *Heterosporium tshawytschae* n.sp. has been isolated from kidney mycoses of yearling chinook salmon (*Oncorhynchus tshawytscha*). The mycelium forms dark brown plaques of pale brown immersed hyphae, with hyaline, marginal and erect hyphae; they are cylindrical, smooth, variable in size, (1·5) 2 to 4 μ in diameter, and sometimes irregularly swollen. The cells are 16 to 20 μ long, often with swollen ends and constricted septa. The conidia, usually arising as sessile, lateral branches either from conidiophores or directly from superficial hyphae, are low-tuberculate, triseptate at maturity, elliptic-oblanceolate, and measure 14 to 20 by 4 to 6 μ. The four locules are equal, cylindrical or slightly swollen, and the apex hemispherical.

This species of *Heterosporium* is distinguished by the small, sparsely scattered warts on the spore surfaces and by the almost constant production of quadrilocular spores, which are small for the genus.

Although the fungus may destroy the kidneys entirely it is thought that its importance as a fish pathogen is slight.

Raychaudhuri (S. P.). **A note on mosaic virus of Sann-Hemp (Crotalaria juncea Linn.) and its crystallisation.**—*Curr. Sci.*, xvi, 1, pp. 26–28, 4 figs., 1947.

A mosaic disease of sann hemp (*Crotalaria juncea*) prevalent at Delhi in the early part of 1946 was characterized by foliar mottling, stunting, and (in severe cases) malformation, the dark green patches alternating with pale ones on the upper surface often being raised, with a corresponding depression on the under side. The microscopic comparison of healthy and diseased leaf sections revealed that the mesophyll tissues are thinner, with fewer intercellular spaces, in the chlorotic areas of the infected foliage, while differentiation into palisade and spongy parenchyma is lacking at an advanced stage; the cells are roughly isodiametric in

transverse section and their chloroplasts somewhat indistinct. The vascular tissue of the mottled leaves showed only occasional hypertrophy of a few of the phloem cells.

The virus proved to be transmissible by rubbing healthy plants with sap from diseased ones, the typical symptoms developing within six to eight days of inoculation: when the young leaves were punctured with insect needles dipped in the inoculum the mosaic appeared after three to four days. The control plants similarly treated with distilled water remained healthy. The thermal death point of the virus was found to lie between 68° and 70° C., its longevity *in vitro* to cover a period of 71 to 76 days, and its tolerance of dilution to range from 1 in 1,000 to 1 in 5,000. The sann-hemp mosaic virus was not transmissible to cowpea, nor could the locally widespread cowpea mosaic virus be communicated to *C. juncea*. Dale concluded from the intertransmissibility of the viruses of these two plants in Trinidad that the causal agent was identical [*R.A.M.*, xxiii, p. 203], in which case the Delhi disease is evidently of different origin. No experiments were reported by Fukushi on *C. juncea* mosaic in Japan [ibid., xi, p. 797], so it is difficult to form an opinion as to its connexion with the virus disease of the same host in India.

A solution of the very fine, acicular crystals resulting from purification of the virus by Bawden's method [ibid., xxiv, p. 137] induced typical symptoms of the disease.

GRENTE (J.). **Une maladie du Lin due à Aschochyta linicola.** [A disease of Flax caused by *Ascochyta linicola*.]—*Ann. Épiphyt.*, N.S., xii, 2, pp. 81–90, 3 figs., 1946.

In May, 1945, specimens of flax sent to the author from Normandy showing symptoms of dryness at the base of the stem and brown coloration for about 5 or 6 cm. yielded a fungus later identified as *Ascochyta linicola* [*R.A.M.*, xxv, p. 526]. This fungus is entirely new to France, and possibly attacks previously attributed to *Phoma exigua* [ibid., viii, p. 151] were really due to this species, especially as the spores of *A. linicola* in the earlier stages are similar to those of *P. exigua*.

The results of experiments not yet complete suggest that contaminated soil does not retain its infectivity for very long [cf. ibid., xi, p. 647], but further experiments on the overwintering of the parasite are being conducted. The disease is not unlike the serious malady known as 'mort-lin' and experiments to test its possible identity with this disorder are in progress.

BARTHELET (J.). **Le mildiou de l'Œillet.** [Carnation mildew.]—*C.R. Acad. Agric. Fr.*, xxxii, 13, pp. 575–577, 1946.

A severe attack of mildew (*Peronospora dianthicola* n.sp. [without a Latin diagnosis]) on double perpetual carnations in frames attributed to the exceptionally wet spring of 1946 was brought to the notice of the Botanical and Phytopathological Station, Antibes. It appeared on the leaves and stems of young cuttings as pale green areas turning to yellow and they finally withered. The conidia rapidly appeared mainly on the under side of the leaf as a violet-grey coating. The thick conidiophores emerging four or five at a time from the stomata were 280 to 300 μ long. The pale violet conidia measured 23·8 by 17·78 μ. The numerous oospores with a thick epispore coated with vermiculate warts were 39 μ in diameter. This species differs from other *P.* spp. on related plants in the size of the conidia and oospores and in the ornamentation of the epispore. The mildew had developed on carnations of the Antibes variety and a considerable range, from total resistance to complete susceptibility, was noticed among its different strains, an important point being the extreme susceptibility of the yellow-flowered forms.

The percentages of diseased plants among other varieties were: Marie Chabaud, Étincelant, 100; Légion d'Honneur, Enfant de Nice white, 80; La Perle, 30;

Magenta, 10; Aurore, Reine pink, Enfant de Nice mauve, 5; Enfant de Nice clove, Enfant de Nice red, 0.

Copper treatments in the right season are hoped to give good preventive results.

McClellan (W. D.) & Stuart (N. W.). **The influence of nutrition on Fusarium basal rot of Narcissus and on Fusarium yellows of Gladiolus.**—*Amer. J. Bot.*, xxxiv, 2, pp. 88–93, 1 fig., 4 graphs, 1947.

Bulbs of King Alfred narcissus [daffodil: *Narcissus pseudo-narcissus*] dipped in aqueous solutions or talc mixtures of indolebutyric acid, naphthalene acetic acid, naphthalene acetamide, transplantone (consisting largely of sucrose, uric acid, and naphthalene acetamide), allantoin, guanidine, uric acid, or nucleic acid before planting in the field at the Plant Industry Station, Beltsville, Maryland, contracted more basal rot (*Fusarium oxysporum* f. *narcissi*) [*F. bulbigenum*] than those dipped in water or untreated [*R.A.M.*, xxii, p. 169]. The adverse effect of naphthalene acetamide (0·01 per cent.) was overcome by the addition of thiosan (1 lb. in 8 gals. water) to the dipping solution after harvest or before planting, or on both occasions. The following percentages of rotted bulbs occurred in the lots given the different treatments: thiosan alone after harvest, 3; thiosan plus 1 per cent. naphthalene acetamide after harvest, 2·3; naphthalene acetamide after harvest, 59·1; thiosan plus naphthalene acetamide after harvest and before planting, 1·8; naphthalene acetamide after harvest and before planting, 44·9; and controls, 22·6.

Texas-grown Sheila gladiolus corms supplied with an organic nitrogen fertilizer derived from blood tankage (160 lb. per acre) produced fewer flowers and corms and developed a higher incidence of rot (*F.o.*f. [var.] *gladioli*) [ibid., xxiv, p. 418] than those in comparable plantings receiving an inorganic nitrogen soil amendment or none. Thus, the total numbers of corms harvested from plots 25 ft. long treated with organic nitrogen, inorganic nitrogen, and untreated were 274, 390, and 352, respectively, the corresponding corm weights being 10·7, 25, and 21·9 lb., respectively, and the numbers of flowers cut, 17, 392, and 316, respectively; the reductions in the organic-nitrogen series were attributed to the effects of the disease.

The growth of cultures of *F. bulbigenum* in a modified Steinberg complete nutrient solution was promoted by the addition of five growth-regulators, viz., naphthalene acetamide, indolebutyric acid, uric acid, allantoin, and adenine sulphate, and purines in amounts ranging from 0·1 to 100 mg. per l. Field-grown daffodil bulbs supplied with factorial combinations of nitrogen, phosphorus, and potassium contracted the maximum and minimum incidence of basal rot where the first- and last-named elements only were used (605 and 498 rotten bulbs, respectively, out of 2,400). In nutrient solutions the mycelium of *F. bulbigenum* grew most profusely at the maximum nitrogen level.

In Picardy gladiolus corms grown in sub-irrigated greenhouse nutriculture benches *F.o.* var. *gladioli* was most prevalent (134 diseased out of 1,760) when a nutrient solution high in nitrogen and low in phosphorus was applied, and least so (13) where equal quantities of the three fertilizers were given.

It is suggested that the increased incidence of daffodil rot following the use of organic nitrogen soil amendments is largely due to the presence in the latter of purines, and further that the extensive substitution of organic for inorganic fertilizers by commercial gladiolus-growers during the war contributed significantly to the spread of *F.o.* var. *gladioli*. The writers are not aware of any previous reports on the use of synthetic hormones or nitrogen bases as an actual factor in the increase of plant-disease losses, but various references have been made to the value of such products as stimulants to the growth of micro-organisms, and a similar observation now applies to the action of adenine, uric acid, and allantoin on *F. bulbigenum*.

ANDRÉN (F.). **Betningsförsök med Lupinfrö 1946.** [Lupin seed disinfection experiments in 1946.]—*Växtskyddsnotiser, Växtskyddsanst., Stockh., 1946*, 6, pp. 91–93, 1946.

In preliminary experiments to determine the relative efficiency of certain fungicides in the control of *Botrytis* [*cinerea*] on lupin [*R.A.M.*, xxii, pp. 161, 360] seed, U.T. 1875 b (200 to 600 gm. per 100 kg.) gave the best results, reducing the incidence of infection from 24·8 to an average of 11·6 per cent. The corresponding figures for panogén (200 to 600 ml.) and betoxin 61 (200 to 600 gm.) were 17·2 and 20·4 per cent., respectively. Tetramethyl thiuramdisulphide [Du Bay 1205—FF], included in the field trials, proved superior to any of the foregoing, the percentages of diseased plants in the plots treated with this compound at 200 and 400 ml. being 6·9 and 19·3, respectively, compared with 38·8 and 20·9, 36·5 and 23·7, and 14·6 and 18·2, respectively, for equivalent dosages of betoxin 61, panogén, and U.T. 1875 b.

CUNNINGHAM (G. H.). **Cause and prevention of silver leaf in orchards.**—*N.Z. J. Agric.*, lxxiv, 2, pp. 137–139, 8 figs., 1947.

This is an account in popular terms of the symptoms, life-history, and preventive treatment for silver leaf, *Stereum purpureum* [*R.A.M.*, xxiv, p. 153]. It is widespread in New Zealand orchards, causing about 1 per cent. loss among apple trees, over 10 per cent. on peach, and even more on plum. It also attacks almond, apricot, cherry, nectarine, pear, and quince trees, and currant and gooseberry bushes, as well as cultivated ornamental shrubs and trees such as laburnum, lilac, poplar, silver birch, and willow [*Salix*]. It has not been found on indigenous plants. The fungus is spread solely by means of spores, no infection being caused through secateurs used in pruning operations.

LEWIS (F. H.). **Studies on spray and dust schedules for control of Apple scab in Western New York.**—*Abstr. Thes. Cornell Univ.*, pp. 335–338, 1944. [Received April, 1947.]

An attempt was made to find a non-injurious spray to replace lime-sulphur for the control of apple scab (*Venturia inaequalis*) [cf. *R.A.M.*, xxvi, p. 202] which is very prevalent in New York [State]. Lime-sulphur solution at 2–100, and at 1¼–100 alone or plus magnetic catalytic sulphur at 4–100, and flotation sulphur paste at 7–100 all gave good control but were not dependable for complete elimination of scab. These results were for the two varieties McIntosh and Rhode Island Greening over a four- and three-year period respectively. It was found in 1942 that magnetic-70 sulphur paste gave better results than the other elemental sulphurs and the same applied to flotation sulphur paste among the dry wettable sulphurs. Fermate plus hydrated lime gave excellent scab control on the leaves but was less effective on the fruit. Of the fungicide-lead arsenate combinations lime-sulphur 2–100 in the sprays before bloom, followed by flotation sulphur paste in the first two after bloom, then Bordeaux mixture in the cover sprays with hydrated lime in all the mixtures, was found to cause less leaf injury than other sulphurs or concentrations of lime-sulphur. Lime-sulphur in the cover sprays seemed to cause greater pre-harvest fruit drop than other materials, and in 1942 caused a 32 per cent. reduction in picked fruit. Lime-sulphur 2–100 in the summer slightly decreased fruit size and tended to cause poorer development of colour while finer sulphurs left spotty deposits in late summer. Sulphur dust gave the best colour development. Fungicides applied while the trees were in bloom tended to decrease the set of fruit on the McIntosh and Cortland varieties and sometimes affected the yield as well; Bordeaux mixture or copper-lime dust at this period caused russeting.

Leaf injury was serious when sulphur was used with oil or within 25 days preceding oil. Dusts applied to apples in Wayne County after the beginning of a

rainy period but before invasion by the scab pathogen gave excellent control. Some adhesives showed promise and can be added to sulphur-lead arsenate dusts quite cheaply.

VANDERWALLE (R.). **Biologie de la tavelure du Poirier.** [The biology of Pear scab.] —*Fruit belge*, xiv, 66, pp. 67–69, 1946.

In this paper the author gives a succinct account of the biology of *Venturia pirina* [*R.A.M.*, xxv, p. 506; xxvi, p. 158], the conidia of which are able to survive the winter, thus increasing spring infection. Ascospore maturation generally lasts from about 18th April until 12th June, the period in Belgium being longer than in regions with a continental climate. Flower infection is infrequent in Belgium and the first phase of scab development generally appears later on pears than apples.

ESTIENNE (V.) & SOENEN (A.). **La moniliose des arbres fruitiers à noyau.** [Moniliosis of stone-fruit trees.]—*Fruit belge*, xiv, 66, pp. 70–80, 2 figs., 1 graph, 1946.

In this study of brown rot of fruit trees in Belgium (in which the economic importance of the disease, and its symptoms, causal organisms, and their nomenclature are reviewed) the authors state that the organisms causing the condition there appear to be *Sclerotinia fructigena*, producing, chiefly, fruit rot of pip and stone fruits, *S. cinerea* f. *mali* [*S. laxa* f. *mali*], causing blossom wilt of pip and stone fruits, particularly on Morello cherries, *S. cinerea* f. *pruni* [*S. laxa*], causing fruit rot and blossom wilt of stone fruits, and *S. laxa* on apricots, which can be regarded as a special form.

Under Belgian conditions, the control of *S. laxa*, particularly f. *mali*, would appear to be even more urgent than that of *S. fructigena*. The former occurs chiefly on cherries, particularly the acid varieties, this host not receiving pre-floral fungicidal applications. In recent years, attack by *S. laxa* has attained epidemic proportions on Morello cherries, and in the Campine certain plantations on light soils are being destroyed by the disease. In the north, damage takes the form of blossom wilt (*S. laxa* f. *mali*), which attacks whole branches and even entire trees, killing them off in a few days. Shortly after blossoming, the affected branches and some of the flowers, which have withered on the tree, become covered with mycelium. Fructifications were frequently found on withered leaves. No infection of peach leaves by *S. laxa* was observed by the writers. Branch infections are considered to follow attacks by other organisms. The flowers are usually badly attacked.

Service and regulatory announcements. List of intercepted plant pests, 1945.—*S.R.A., B.E.P.Q., U.S. Dep. Agric.*, 47 pp., 1946.

Among the pathogens intercepted on plant material entering United States territory during the period from 1st July, 1944, to 30th June, 1945, inclusive [cf. *R.A.M.*, xxiv, p. 128], were *Bacterium* [*Xanthomonas*] *citri* [cf. *I.M.I. map*, No. 11] on grapefruit and *Phoma citricarpa* on oranges and lemons from Australia [*R.A.M.*, xxiii, pp. 104, 175], *Elsinoe australis* on orange and lemon from Brazil [ibid., xxii, p. 176], *Sclerotinia fructigena*, not known to occur in the United States [ibid., vi, p. 619], on an apple in stores from Portugal, and *Cladosporium pisicola* on peas, originally described from California [ibid., xiv, p. 71], also in stores from Portugal.

NYE (G. W.). **Summary of legislative changes.**—*Rep. Dep. Agric. Nyasald, 1945*, Part I, p. 12, 1947.

Government Notice No. 44 of 1945 amends the schedules to the Plant Pests and Diseases Ordinance [*R.A.M.*, xvi, p. 80] by the addition of tomato seeds to the first and of tomato bacterial blight [*Corynebacterium michiganense*] to the second.